

TRIAL BY FIRE: FORGING AMERICAN CLOSE AIR SUPPORT
DOCTRINE, WORLD WAR I THROUGH SEPTEMBER 1944

A thesis presented to the Faculty of the U.S. Army
Command and General Staff College in partial
fulfillment of the requirements for the
degree

MASTER OF MILITARY ART AND SCIENCE
Military History

by

PHILIP W. WIELHOUWER, Major, USAF
B.S., U.S. Air Force Academy, Colorado, 1990

Fort Leavenworth, Kansas

2004

Approved for public release; distribution is unlimited.

MASTER OF MILITARY ART AND SCIENCE

THESIS APPROVAL PAGE

Name of Candidate: Major Philip W. Wielhouwer

Thesis Title: Trial by Fire: Forging American Close Air Support Doctrine, World War I Through September 1944

Approved by:

_____, Thesis Committee Chair
Lieutenant Colonel Marlyn R. Pierce, M.A.

_____, Member
Jerold E. Brown, Ph.D.

_____, Member
Lieutenant Colonel Ralph S. Hansen, M.M.A.S.

Accepted this 18th day of June 2004 by:

_____, Director, Graduate Degree Programs
Robert F. Baumann, Ph.D.

The opinions and conclusions expressed herein are those of the student author and do not necessarily represent the views of the U.S. Army Command and General Staff College or any other governmental agency. (References to this study should include the foregoing statement.)

ABSTRACT

TRIAL BY FIRE: FORGING AMERICAN CLOSE AIR SUPPORT DOCTRINE,
WORLD WAR I THROUGH SEPTEMBER 1944, by Maj Philip W. Wielhouwer, 98
Pages.

Proper doctrine for close support of American ground forces by airpower has been a tumultuous issue since the first days of combat aircraft. Air and ground leaders struggled with interservice rivalry, parochialism, employment paradigms, and technological roadblocks while seeking the optimum balance of missions given the unique speed, range, and flexibility of aircraft. Neither ground force concepts of airpower as self-defense and extended organic artillery, nor air force theories focused on command of the air and strategic attack fit the middle ground of close air support (CAS), leaving a doctrinal void prior to American combat in World War II. This thesis focuses on the critical period from September 1939 through the doctrinal and practical crucible of North Africa, which eventually produced a resoundingly successful system. Theoretical and practical changes in organization and command, airpower roles, and the tactical air control system are examined, with subarea focus on cooperation and communications technology. Upon examination, discerning leadership, able to transcend earlier compromises and failures, emerges as the essential element for CAS success during the war. While many airpower concepts proved valid, air-ground cooperation through liaison proved indispensable, a lesson repeated even today.

ACKNOWLEDGMENTS

It is with thorough gratitude and a modest heart that I wish to convey my thanks to those who helped in the process of writing this thesis. To LTC Marlyn Pierce, my committee chair, whose careful guidance allowed me to explore areas of both interest to potential readers and me; to Dr. Jerold Brown, who provided keen insights on historical prose and research methodology despite temporary duty dislocating him from Ft Leavenworth; and to Lt Col “Ralphie” Hansen, who offered his extensive historical knowledge of CAS from an operator’s perspective, while emphasizing organization and readability in my work. Many thanks also go to Dr. Christopher Gabel, my history instructor at Command and General Staff College, as he provided both sources and a sounding board for my nascent thoughts. At the Air Force Historical Research Agency, Maxwell AFB, Alabama, Mr. Dennis Case and Ms. Toni L. Petito admirably suffered my constant requests for documents and files during my research there, and volunteered further sources based on their extensive knowledge. To Ms. Helen Davis, Ft Leavenworth’s foremost expert on format and thesis structure, I thank you as well. Most significantly, I thank my beautiful and wonderful wife Valarie, who put up with many long trips “Up North” to support my research and writing, and provided expert editing to my text, all while caring for our son Jake. I could not have done it without you.

TABLE OF CONTENTS

	Page
MASTER OF MILITARY ART AND SCIENCE THESIS APPROVAL PAGE	ii
ABSTRACT.....	iii
ACKNOWLEDGMENTS	iv
ACRONYMS	vi
CHAPTER 1. INTRODUCTION	1
CHAPTER 2. SETTING THE STAGE: MARCH 1916 TO SEPTEMBER 1939.....	5
CHAPTER 3. INTO THE CRUCIBLE: SEPTEMBER 1939 TO JUNE 1943	16
CHAPTER 4. PERFECTING THE SYSTEM: JULY 1943 TO SEPTEMBER 1944	56
CHAPTER 5. CONCLUSIONS	73
BIBLIOGRAPHY.....	82
INITIAL DISTRIBUTION LIST	90
CERTIFICATION FOR MMAS DISTRIBUTION STATEMENT	91

ACRONYMS

AAC	Army Air Corps
AAF	Army Air Force
ACTS	Air Corps Tactical School
AEF	American Expeditionary Force
AGF	Army Ground Force
ALO	Air Liaison Officer
ASC	Air Support Command
ATF	Air Task Force
CAS	Close Air Support
FAC(A)	Forward Air Controller (Airborne)
FM	Field Manual
GHQ	General Headquarters
HQ	Headquarters
NAAF	Northwest African Air Force
NATAF	Northwest African Tactical Air Force
RAF	Royal Air Force
RFC	Royal Flying Corps
TACS	Tactical Air Control System
TC	Training Circular
TR	Training Regulation
US	United States
WD	War Department
WDAF	Western Desert Air Force

CHAPTER 1

INTRODUCTION

During World War II, the Allied Powers found themselves embroiled in a fight for survival on the European continent and lands beyond. Suspected, but unknown at the time was the significant role airpower would play in the struggle to defeat the Axis powers. This thesis focuses on the mission of close air support (CAS), employing airpower against tactical targets, those with the most immediate and transient effects during battle, in direct support of friendly forces. The definition of CAS has fluctuated with time; however, on the cusp of American combat in Europe, it was “the immediate support of ground forces where contact with the enemy is imminent or has already been established.”¹

Although numerous factors impacted CAS success in World War II, the focus here will be on three, analyzing each considering development and application in doctrine and execution. These factors are: (1) organization, command, and control, specifically as they relate to the use of air support, (2) the role of airpower as planned and integrated to support ground forces, and (3) the personnel, equipment and procedures for requesting and controlling CAS, which, for the purposes of this thesis will be referred to as the tactical air control system (TACS). It is important to note that the concept of “liaison” is inextricable from the discussion, at both the operational and tactical levels. In this discussion, a liaison is someone assigned or attached to another branch or service for the purpose of advising, planning, coordinating, cooperating or executing a mission involving both services.

Keeping these factors in mind, this thesis explores the doctrinal development of tactical airpower during the evolutionary period beginning in World War I, through the interwar period, ultimately focusing on lessons learned in North Africa, Italy, and northwestern Europe in World War II. Tremendous leadership, innovation, critical mission analysis, and technological advancement changed the Allied forces organization, command, and control methods, application of close support, and employment of tactical air control despite being heavily engaged in two theaters, ultimately delivering combat effects to support the ground forces.

The implications of airpower's combat potential were just beginning to be realized by the close of World War I. Advantages in speed and range over surface forces on the battlefield offered dramatic possibilities for missions, both tactical and strategic in nature. Initially used for observation, artillery spotting, and reconnaissance, it did not take long to realize the potential of air delivered weapons. Attacking targets beyond the battle might hasten conflict termination, while air-to-air combat meant freedom from observation and air attack. However, what many ground units wanted to know was: How will aircraft affect the localized battle by attack of front line enemy troops and equipment? While World War I provided American airmen the chance to execute these missions, the war ended with American airpower in relative infancy, with just a few tastes of close support to analyze. Following the November 1918 Armistice, tactical airpower was relegated to the background as strategic bombing theory and its advocates stepped into the limelight of doctrine development.

Between the wars, airpower doctrine developed and flourished at the Air Corps Tactical School (ACTS) at Maxwell Field in Alabama, emphasizing air superiority and

strategic bombardment, while neglecting battlefield air attack as impractical and inefficient. Air theorists of the day emphasized the aircraft's ability to operate independently from the land force with its freedom of maneuver, increased range, and greater speed. The ACTS text *The Air Force (1930)*, asserted: "The air force does not attack objectives on the battlefield or in the immediate proximity thereof, except in the most unusual circumstances," and air attacks should not be used within artillery range or against enemy troops "except in cases of great emergency."²

As years passed, air and land force leaders debated the relative merits of airpower and its role in ground battle. What little doctrine was written consisted of watered down principles, the result of extensive compromise between the forces. Conceptual in nature, with little teeth for actual employment, manuals like Training Regulation (TR) 440-15 (1935) and Field Manual (FM) 1-5 (1940) were less controversial in peacetime, but proved inadequate for World War II combat operations.

The period between Germany's attack on Poland in September 1939 and the Allied invasion of North Africa in November 1942 bristled with activity as the American war machine rumbled to life. President Roosevelt's November 1938 plan to defend the United States (US) from German aggression with the Army Air Corps (AAC) already called for 5,500 planes, and when France reeled in May 1940, Roosevelt asked Congress to increase the requisition to 50,000 planes.³ This exponential growth rate forced the AAC to rapidly train and equip vast numbers of new airmen, and simultaneously create the required fighting procedures. American airmen actively observed British methods of close support, even using the Royal Air Force (RAF) TACS as a template for their own. Air support tests conducted with the Army throughout 1941 desperately struggled to

forge a workable system, yet the results left much to be desired, prompting Major General Henry H. “Hap” Arnold, then Chief of the Air Corps, to concur with Army leaders that “air-ground coordination still needed work.”⁴ This stood in contrast to the German air support system, which the Allies observed rolling across Poland and France. While the Germans did not always execute CAS as defined here, the message was clear, the enemy would fight a well-coordinated, combined arms battle.

As the Allies prepared for their invasion of North Africa, in April 1942 the War Department (WD) published FM 31-35, *Aviation in Support of Ground Forces*, as the culmination of the previous year’s exercises and development. Yet this doctrine again compromised between Army and Air Force views on numerous key issues: How would airpower be organized? Who would command and control the force? What role would airpower play while supporting the troops on the ground? What would the TACS look like and how would the communications system work? Finally, what induced the transformation of the American CAS system in eighteen short months? It is the answers to these questions over the course of four Allied invasions in the Mediterranean and European theaters that this thesis is focused.

¹US War Department, Basic Field Manual 31-35, *Aviation in Support of Ground Forces* (Washington, D.C.: Government Printing Office, 9 April 1942), 2.

²Lee Kennett, *Developments to 1939*, in *Case Studies in the Development of Close Air Support*, ed. Benjamin Franklin Cooling (Washington, D.C.: Office of Air Force History, Special Studies, 1990), 47.

³Robert Frank Futrell, *Ideas, Concepts, Doctrine*, vol. 1, *Basic Thinking in the United States Air Force, 1907-1960* (Maxwell AFB, AL: Air University Press, December 1989), 91, 101.

⁴Christopher R. Gabel, *The U.S. Army GHQ Maneuvers of 1941* (Washington, D.C.: US Army Center of Military History, 1992), 171.

CHAPTER 2

SETTING THE STAGE: MARCH 1916 TO SEPTEMBER 1939

In the history of ground attack . . . the existing air arms often rejected any real need for [close air support]. The major missions would be strategic, operating deep within an enemy's territory in classic Douhet or Mitchell fashion. The realities of war, specifically the wars of the 1930's, quickly revealed the fallaciousness of such thought, and the Second World War demonstrated the absolute necessity of appropriate doctrine to address ground-attack needs.¹

Richard P. Hallion, *Strike from the Sky*

Early on, airmen recognized the aircraft's potential to influence a ground battle due to its freedom of movement and improved battlefield view. Just two years after the Wright brothers first demonstrated their aircraft for European and US military audiences, professional military journals touted its potential to revolutionize the reconnaissance mission. With its first combat exposure, aircraft added bomb dropping to its duties, with a corresponding increase in the belief that aircraft would make a difference in ground combat.²

The airplane's first combat with American forces occurred in March and April of 1916 when the First Aero Squadron valiantly attempted to support Brigadier General John J. Pershing's punitive expedition against the Mexican outlaw Pancho Villa. Though severe weather prevented effective reconnaissance or attack support for Pershing, aircraft potential as a fast, maneuverable observation and attack platform emerged.³ While the US experimented with airpower (without any air combat employment doctrine), the British were actively using airpower for ground attack against the Axis forces in World War I. Armed reconnaissance and trench strafing missions occurred sporadically, reflecting

individual initiative rather than any official policy or doctrine. Despite this, British use of airpower greatly influenced American airmen's ideas of centralized control of airpower, and its use in support of ground forces.⁴

The origin of American air combat doctrine can be traced to May 1917, when Lieutenant Colonel William "Billy" Mitchell, then a Signal Corps officer assigned to the American Expeditionary Force (AEF) advance leadership in Europe, spent several days with Major General Hugh Trenchard, the British Royal Flying Corps (RFC) commander in France. Trenchard's policies unified all British aviation under one commander, dedicated a minimum number of aircraft for tasking by ground troops with each army, and emphasized large numbers of bombardment and pursuit aircraft to "hurl a mass of aviation at any locality in need of attack."⁵ These principles greatly influenced Mitchell, but conflicted with the ideas for airpower organization and employment of General Pershing, commander of the AEF. Conceptually, Pershing understood military aviation must primarily command the air, but he subsequently projected that target selection "would depend solely upon their importance to the actual and projected ground operations." US aviation organization reinforced this concept, divided and integrated into division and larger ground units, where subordinate Air Service commanders gave advice, but ultimately executed ground commander decisions.⁶

As war dragged on, some success was achieved in the closely linked issues of the role of airpower and its command and control. In the fall of 1917, Mitchell delivered what was probably the first formal statement of Air Service doctrine in a paper entitled "General Principles Underlying the Use of the Air Service in the Zone of Advance, AEF." The roles defined for tactical aviation were: (1) observation, (2) pursuit, and (3)

tactical bombardment. It then defined tactical bombardment as operating within 25,000 yards of the front lines to assist in the destruction of enemy material (what is now considered interdiction), and to undermine enemy morale. Beyond enemy aircraft destruction, pursuit planes took on a secondary role of creating diversions by attacking enemy ground positions.⁷

While close support did diminish enemy morale (British “trench strafing” missions are excellent examples), the paper failed to adequately define close support employment, and certainly fell short of RFC advances in air-ground cooperation. By November 1917 RFC fighters were escorting British tanks and attacking enemy artillery positions that threatened the ground force, and on 23 November 1917 airpower facilitated a British ground advance when “the attacking troops would otherwise have been pinned to the ground.”⁸ American thoughts on the roles of airpower had not yet advanced to this level.

A breakthrough in airpower command and control, and consequently its use occurred in September 1918 during the Allied St. Mihiel offensive. Here Mitchell argued for and received command of 1,481 French, British, Italian and American aircraft to use as a unified force to support the American First Army over a three-day period. Executing counterair missions until air supremacy was attained, the force then massed and attacked all available surface targets, successfully smashing German forces retreating on the Vigneulles-St. Benoit road.⁹ Unprecedented coordination and concentration of airpower effectively achieved air supremacy, isolated a battlefield, and rendered close support while pursuing a retreating force.

Beyond codified doctrine, the essential component lacking in World War I CAS was a reliable communications system. For CAS aviators to maximize effects on the battle at hand, they needed to communicate with ground troops, understand their location and situation, and identify targets the ground commander wanted destroyed. Although air-ground radio telegraphy had been experimented with as early as 1911, radio equipment was not perfected or widely distributed.¹⁰ In fact, current radio equipment was primitive in the extreme, and extremely prone to break down.¹¹ When Mitchell effectively used radio communication in his mass air operation at St Mihiel, its function was command and control of his formation, not communication with ground troops.¹² Without verbal communication, and consequently lacking a TACS, troops and pilots improvised, creating a system of visual signals, panels, and hand-written messages, while maximizing the use of liaison officers.

In 1918, Mitchell reflected: “our pilots had to fly right down and almost shake hands with the infantry on the ground to find out where they were.” Communication was almost exclusively one way with ground forces either laying out panel signals or firing colored flares to identify their positions, sometimes even spelling out messages in colored panels on the ground. The pilot’s sole means of responding was via hastily scribbled messages, which were tossed overboard to the troops on the ground, or tied to homing pigeons, released to find their way to headquarters (HQ). Inconsistent to a fault, the system drove Allied pilots to operate on a virtually prebriefed basis, updating their maps prior to takeoff, then striking targets across the last known front lines. Occasionally pilots visually identified friendly from enemy troops by distinctive uniforms and equipment;

however, this was exceptional due to similar uniform colors and the low profile nature of trench warfare.¹³

A more reliable method of communication was the liberal use of liaison officers between the service branches. Allied air, armor, and infantry units exchanged officers to act as expert advisors to the receiving commanders. Liaisons lent expertise where needed, facilitated intelligence exchange, and insured relatively current unit status, mission and priorities.¹⁴ At times this partnership worked well, yet given the overriding concern about inconsistent air-ground synchronization, and to reduce fratricide potential, air leaders imposed restrictions on aircraft directly supporting ground forces. By late 1918 Mitchell's guidance limited strafing attacks to enemy reserves poised for counterattack, and only if "infantry signaling is efficient."¹⁵ Any further innovations to air-ground cooperation and support were made by individuals in violation of the restricting orders. As World War I closed, most cooperation channels closed as the Army Air Service began a long period of relative neglect of CAS.

The close support mission fell victim to a power struggle between the Army and the Army Air Service (and its successors, the AAC in 1926, and the Army Air Force (AAF) in 1941) over airpower control and its combat missions. Despite the obvious wartime need for CAS, airpower advocates emphasized air superiority and long range strategic bombing as the primary air missions, whereas ground force advocates emphasized ground support. The ensuing struggle demonstrated Air Service desires for control, resources, and a share of the dwindling peace-dividend budget, while the Army stood by its desire for organic CAS at the expense of long-range effects. A sequence of published treatises, manuals, and doctrine reflected service preferences in organization

and employment, while ignoring the peacetime opportunity to advance liaison concepts, communications, and a TACS.

Several investigative boards convened following World War I's end hoping to capture combat lessons learned and make recommendations for future force development. The first, convened by General Pershing, now Chief of Staff of the Army, reported that Air Service performance in "air combat against ground troops was not well developed." He predicted this method of attack would eventually be more decisive than strategic bombing operations, therefore requiring immediate Air Service attention and focus.¹⁶ This point was seconded in 1919 by Director of the Air Service, Major General Charles T. Menoher, who's board reported: the "outstanding defect of the Air Service, AEF, had been its lack of cooperative training with the Army," quoting extensively from the Pershing Board's finding that airpower primarily supports ground operations.¹⁷ Mitchell, now Chief of the Air Service Training and Operations Group, continued to influence doctrine through his writings and instructional materials. His January 1920 paper, "Tactical Application of Military Aeronautics," defined the primary mission of aeronautics as the destruction of the enemy air force, then the attack of ground and sea formations. He held as secondary airpower employment as an auxiliary to troops on the ground for "enhancing their effect." This paper contrasted starkly with the April 1919 *Tentative Manual for the Employment of the Air Service*, drafted by Army HQ, which stated: "When the Infantry loses, the Army loses. It is therefore the role of the Air Service . . . to aid the chief Combatant, the Infantry."¹⁸

Utilizing more than individual aviators and theorists to formulate doctrine, the Air Service created a series of organizations, permanent boards and "think tanks" to theorize

and document airpower employment guiding principles. Beginning with the Air Service Field Officer's School in February 1920, subsequent institutions teaching airmen and generating doctrine included the Air Service Tactical School from 1922 to 1926, the ACTS from 1926 to 1942, the Air Corps Board from 1922 to 1942, and the Army Air Force Board from 1942 to 1945. Specifically working CAS issues within the Air Corps Staff were the Army Air Support Staff Section, and its successor, the Ground Support Division of the Directorate of Military Requirements, which opened in March 1942. Working in conjunction with the AAF School of Applied Tactics from October 1942 through the war's end, these organizations tackled the complex issues associated with CAS, blending creative thinking and fresh combat experience from the Mediterranean and European theaters. As organizations for doctrinal change leading up to and during World War II, they produced the TRs, FMs, and training circulars (TC) used in combat. For a more thorough discussion of each organization, see Finney's text, *The History of the Air Corps Tactical School, 1920-1940*, and Futrell's *Ideas, Concepts, Doctrine*, vol. 1, *Basic Thinking in the United States Air Force, 1907-1960*.

Airpower doctrine development during the 1920s and 1930s centered on the fundamental question of principal and ancillary roles of aircraft in combat. Predictably, army ground forces (AGF) emphasized aspects that impacted their battle directly, while AAC leaders continued to promulgate ideas for control of the air and strategic bombing. With a simultaneous fight for a separate air service, air support doctrine written in this period only lightly touched the issues of liaison, tactical command and control, and communications. The AAC avoided prioritizing these "support" issues, to prevent distraction from their primary concerns.

Airpower's roles were enumerated in the publication of two versions of TR 440-15, *Fundamental Principles for the Employment of the Air Service*, first released on 26 January 1926, and again on 15 October 1935. The 1926 document stated: "The organization and training of all air units is based on the fundamental doctrine that their mission is to aid the ground forces to gain decisive success."¹⁹ Lending validation to this doctrine, TR 440-15 was accompanied by an Army General Staff approved policy stating: the "role of the air service was to assist the ground forces to gain strategical and tactical success by destroying enemy aviation, attacking enemy ground forces and other enemy objectives on land or sea . . . and protect ground forces from hostile aerial observation and attack."²⁰ The significant compromise achieved by placing "destroying enemy aviation" first, followed by the vague "attacking enemy ground forces and other objectives" moved WD policy towards the ACTS precepts of air superiority and strategic bombing. Scarce discussion of ground support meant a lack of priority in developing CAS procedures and techniques.

In December 1933 the WD directed an Air Corps review and revision of its training regulations and manuals to ensure proper dissemination of air superiority and strategic bombing principles. Thus, it was no surprise when a June 1934 Air Corps General Headquarters (GHQ) command post exercise report indicated, "the bombardment plane was to be the most significant element of the GHQ air force." Aircraft in support of ground forces fell a distant fourth in priority.²¹ The Army's War Plans Division fought back in January 1935 when it drafted its own revision of TR 440-15, emphasizing superior airpower solely in support of ground operations, relegating other airpower to continental defense, and virtually eliminating air superiority and strategic bombing

functions. The ACTS commandant, heavily involved in the AAC doctrine review promptly criticized the AGF regulation by reiterating the crucial nature of attacking vital targets of the enemy economy and infrastructure, while achieving air superiority to enable direct support of the ground battle.²²

When finally republished on 15 October 1935, TR 440-15 reflected additional compromises appealing to both AGF and AAC proponents. It listed GHQ Air Force functions as operations first, “beyond the sphere of influence of ground forces,” second, “in immediate support of ground forces,” and third, accomplishing “coastal frontier defense.”²³ The vague phrase “beyond the sphere of influence of ground forces,” satisfied airmen’s passion for long range attack and air superiority, while ground leaders were satisfied with airpower roles during a ground battle, even though limited to attacks against massed and reserve enemy formations. TR 440-15 correctly identified that air-ground operations required close coordination, but failed to address methodology for attack in a fluid battle, or a mechanism for requesting and controlling air support. General principles of sound organization, effective training, and quality equipment were listed as requirements for effective air action, yet it made no mention of air-ground communications or interservice training. Vague and watered down, TR 440-15 did not provide enough clear direction to aid in actual combat operations.

As Germany postured its growing military during 1938 and 1939, tensions in Europe precipitated the advance of US airpower, even as doctrine continued to lag. The August 1938 WD decision to acquire only light and medium attack aircraft, while developing only close support aircraft was reversed in September 1939 when President Franklin D. Roosevelt ordered the mass production of all manner of aircraft, granting a

virtual blank check to the AAC for procurement and expansion.²⁴ The activation of the great US industrial machine forced leaders to develop usable doctrine for the coming war.

The lack of development of air support for ground forces during the period leading up to World War II resulted from feuding between the branches over fundamental airpower roles, a conspicuous absence of joint exercises and integration, and above all, a lack of urgency, i.e. troops dying on the field of battle. As a result, no true attempt was made to resolve the problems recognized twenty years earlier at the end of the First World War. What the Menoher Board reported in 1919 remained true, lack of training and cooperation between the services, fueled by airmen and soldiers focused on proving their own current doctrine models had crippled CAS development. Not until well into World War II would these problems be appropriately resolved.

¹Richard P. Hallion, *Strike from the Sky: The History of Battlefield Air Attack, 1911-1945* (Washington, and London: Smithsonian Institution Press, 1989), 3.

²Ibid., 11.

³Robert Frank Futrell, *Ideas, Concepts, Doctrine*, vol. 1, *Basic Thinking in the United States Air Force, 1907-1960* (Maxwell AFB, AL: Air University Press, December 1989), 19.

⁴Hallion, 19.

⁵Futrell, 20-21.

⁶Thomas H. Greer, *The Development of Air Doctrine in the Army Air Arm: 1917-1941* (Maxwell Air Force Base, AL: USAF Historical Division, Research Studies Institute, Air University, 1955; reprint, Washington, D.C.: Office of Air Force History, 1985), 3-5.

⁷Futrell, 22.

⁸Hallion, 20-21.

⁹Greer, 5-6.

¹⁰Ibid., 3-5.

¹¹Ibid., 39.

¹²Hallion, 25-26.

¹³Ibid., 21-23.

¹⁴Ibid., 40.

¹⁵Ibid., 39.

¹⁶Futrell, 28.

¹⁷Greer, 21.

¹⁸Futrell, 29-33.

¹⁹US War Department, Air Corps Training Regulation 440-15, *Employment of the Air Forces of the Army* (Washington, D.C.: Government Printing Office, 26 January 1926).

²⁰Futrell, 52.

²¹Ibid., 75.

²²Ibid., 77.

²³US War Department, Air Corps Training Regulation 440-15, *Employment of the Air Forces of the Army* (Washington, D.C.: Government Printing Office, 15 October 1935).

²⁴Greer, 91-92.

CHAPTER 3

INTO THE CRUCIBLE: SEPTEMBER 1939 TO JUNE 1943

Leaders of the rapidly expanding US armed forces recognized intensive work was needed to develop and incorporate the Air Corps into an effective fighting force. Even as General Arnold sent observers to watch and learn from Europe's war, the Air Corps Board scrambled to produce aviation doctrine fitting to the changing times and aircraft capabilities. Based on the foundation documents of FM 1-5, *Employment of Aviation of the Army* (15 April 1940), and FM 1-10, *Tactics and Technique of Air Attack* (20 November 1940), the Air Corps training plan expanded, providing enough guidance and expertise to conduct joint exercises with its parent service. Each exercise, together with associated TCs (War Department publications produced beginning in 1940 as a means to expedite dissemination of new doctrine), helped evolve air-ground doctrine, until at last the academically produced FM 31-35 was published in April 1942. Despite combat experience by both British and American forces proving many of FM 31-35's notions faulty, CAS doctrine charged into battle during Operation Torch in a flawed state. The resulting lessons learned forced the Allies into a sweeping reorganization, the second and third order effects of which ultimately proved successful in developing ground support doctrine for subsequent theaters of Sicily, Italy, and France.

FM 1-5 (which superseded TR 440-15 of 1935), the Air Corps Board's attempt to summarize airpower employment as a whole, used much of a September 1939 self-generated report on the subject verbatim.¹ The following manual, FM 1-10, dealt primarily with strategic bombardment (any attacks on ground targets were covered in the manual); however, it did address in greater detail issues of air-ground cooperation and

communication requirements. While falling short of solving air-ground support challenges, both manuals provided a foundation for CAS doctrine, and left it to “thorough joint training and tactical exercises . . . to develop sound tactical doctrines for employment.”²

FM 1-5 described the mission of Support Forces to be a “nucleus of aviation especially trained in direct support of ground troops and designed for rapid expansion.”³ No definition was offered for “direct support”; however, it later emphasized “support aviation is not employed against objectives which can be effectively engaged by available ground weapons within the time required. Aviation is poorly suited for direct attacks against small detachments or troops which are well intrenched or dispersed.”⁴ Describing light bombardment forces as the primary direct support element to attack exposed troop concentrations, FM 1-5 further declared troops in forward areas as “rarely profitable targets” and justified their attack only in exceptional circumstances.⁵ By FM 1-5 definitions, airpower would not have a primary role on the active battlefield, but instead would interdict lines of communication and attack echelons of enemy tank or mechanized formations massed for attack.

FM 1-10 reinforced the FM 1-5 idea that air attack in support of ground forces was “applied most effectively” by blocking or delaying movements of reserves, disrupting lines of communications and in general, isolating the battlefield.⁶ Light bombardment aircraft would be the principal air support forces while pursuit aircraft maintained a capability against ground personnel and light materials.

The manual’s seven-page section entitled “Support of Ground Forces” solidified the image of attack aviation working in close coordination with armored forces while

reinforcing FM 1-5 themes. Emphasizing air superiority and isolation of the battlefield by attacking reserve forces and lines of communication, it made minor reference to attacks against mechanized and armored forces, only when it was not “practicable to employ other [organic] means of attack . . . in the time available.”⁷ Lastly, it broadly addressed “procedures” for effective command relationships, communications, liaisons, planning, and reconnaissance in various levels of detail. These short paragraphs of FM 1-10 contributed to CAS doctrine most significantly as they formed the basis for the tactic of armored column support, used with devastating effectiveness in France beginning in July 1944.

Whoever commanded and effectively controlled available airpower ultimately determined its role in combat. This fact made command and control a topic of considerable debate, which both FM 1-5 and FM 1-10 avoided with compromising wording. Both manuals stated air forces during wartime should operate under the overall commander of fielded forces; however, each allowed for the attachment of air units to tactical ground commands as low as corps level.⁸ FM 1-5 further proclaimed, “The superior commander, under whom the aviation is operating is responsible for the assignment of air missions or objectives,”⁹ while FM 1-10’s “temporary decentralization . . . may be necessary” to guarantee timely and responsive employment¹⁰ proved invalid during initial combat air operations. North African operations highlighted several potential pitfalls associated with dividing airpower between ground commanders within the same theater. First, no concerted effort to attain air superiority (one of the basic requirements for effective air support) resulted in both attack by enemy air forces and its by-product, ineffective CAS. Second, dissipating scarce aircraft increased their

vulnerability to attack, and limited their ability to damage and destroy targets by massing effects. Third, aircraft distribution promoted the faulty notion that shorter command lines guaranteed superior responsiveness and performance.

The question of air superiority arises when any portion of the divided air forces does not have the physical assets needed to attain control of the air and have sufficient remaining assets for air-to-ground missions. In terms of close support, an individual corps may be in desperate need of air support, but for any number of reasons has no aircraft available. An adjacent corps has aircraft available within range, but not the mission to support the corps under attack. This example played out during the North African campaign, when Major General Lloyd Fredendall, American II Corps commander, refused air support to the French XIX Corps. The French endured a brutal German assault, while Fredendall's aircraft flew local air cover with no enemy air or ground activity present.¹¹

No matter who controlled the air forces, fundamental employment differences meant that to work together, a method of idea and information exchange was required--a liaison program. FM 1-5 did not specifically address the cooperation a liaison team would provide for air and ground units, rather it acknowledged the complexity of combined operations, stating training must be "frequent and progressive" for ground commanders to understand their coordination.¹² While unstated in FM 1-5, the complex requirements for effective air-ground cooperation received more attention in FM 1-10. Falling short of mandating liaison elements, it proposed that to "ensure the prompt execution of aviation support missions . . . positive advance arrangements must be made for simple, prompt communication between the ground forces and supporting aviation." It further stated:

“Extensive interchange of liaison officers . . . will contribute to a thorough understanding of . . . each force” and “will facilitate proper employment and coordination.”¹³ Despite logistical difficulties and obstacles, this unequivocal concept carried forward in future training exercises and combat operations.

Broad in nature, FM 1-5 made no mention of a system to coordinate requests for close support or to guide pilots to the correct target. Evidence of air-ground radio capability existed in the manual’s “Reconnaissance, Observation and Liaison” section,¹⁴ but it left elaboration to FM 1-10. While not specifically an air support request system, FM 1-10 proposed an operational communications link stating: “direct radio telephone” communication should be provided between ground and supporting air forces. It later described signaling procedures including panels and pyrotechnics to be refined and understood by all participants. In addressing target designation, unit training on signal lamps, pyrotechnics, tracer ammunition and aircraft maneuver methods was to be conducted.¹⁵ Despite the desire for direct radio contact, current technological limitations prevented its establishment as primary or reliable. FM 1-45, *Signal Communications* (4 December 1942), echoed this sentiment when discussing the “ability of ground forces to indicate to supporting aviation specific . . . combat objectives,” declaring: “Radio communication in itself and by itself has not proved adequate for this purpose.”¹⁶ With the foundation laid by FM 1-5 and FM 1-10 for command and control, airpower use, liaison, and a TACS, the Air Corps initiated training and evaluating necessary joint skills through larger, multi-service training events.

During 1941, the Air Corps conducted air support tests at Fort Benning, Georgia, at the Army GHQ maneuvers in Louisiana, and at the Army GHQ maneuvers in the

Carolinas, integrating both service's training and doctrine development. Results of the Fort Benning tests were documented and procedures published as TC No. 52 (29 August 1941), guiding the Louisiana and Carolina maneuvers air plans. In turn, the fruits of those efforts were published first in TC No. 70 (16 December 1941), and subsequently in FM 31-35, *Aviation in Support of Ground Forces* (9 April 1942). These publications documented American CAS doctrine development's tentative first steps.

When the WD issued its June 1939 training directive to the rapidly expanding Air Corps, it recognized the "constant and rapid" development of technology and directed GHQ Air Force (combat aviation) units to serve as agents for combat tactics development. Any innovations, especially those made in joint operations or intercommunications, were to be forwarded up the chain of command for review. Air operations in conjunction with ground operations were to be scrutinized, with special attention paid to air-ground coordination and radio training.¹⁷ As Chief of the Air Corps, General Arnold took immediate action to remedy the coordination void by stressing the "vital importance of developing tactics and techniques necessary in rendering close air support to mechanized forces."¹⁸ By December 1940, WD and AAC personnel had scheduled the testing forums in an attempt to mold ideas into usable systems.¹⁹

The first tests took place in Georgia between 10 January and 17 June 1941, involving Fort Benning's IV Army Corps supported by the 17th Bombardment Wing (Light) operating from Savannah Army Air Base. Specifically tasked with "developing doctrines and methods for aviation support of ground forces," participants planned and executed three phases. Phase one developed the TACS, including command post and communications procedures, intelligence functions, and message passing. Phases two and

three added air support missions, with a total of nine combined air-ground events completed.²⁰ These tests produced the “air support control” system, which received and evaluated support requests and filled those deemed appropriate. With an average response time (from ground alert aircraft) of one hour, nine minutes from request to aircraft arrival, results were promising; however, improved communication equipment and procedures were still needed.²¹ Despite these promising results, a 1 June 1941 Air Corps addendum to its training requirements failed to incorporate any of the new procedures, leaving joint training up to individual units, stating: “at the proper stage in unit training . . . opportunities will be sought to engage in co-operative exercises and maneuvers with other arms.”²² Emphasizing individual aircraft and basic flying skills, Air Corps leadership acknowledged the fact that most air support units were not prepared to train to or execute the nascent air support doctrine.

To facilitate dissemination of the new air support procedures, and with an eye toward more joint operations, TC No. 52, *Employment of Aviation in Close Support of Ground Troops*, was published on 29 August 1941, just prior to the Louisiana maneuvers. Minimally dealing with the issues of command, control, and role of air support aircraft, TC 52 contributed significantly to CAS doctrine by establishing an air force command post to be closely linked to the ground force command post, expanding the air support request system, and detailing extensive radio and landline links between air and ground command elements. These fundamental procedures contributed to the planning and execution of follow on tests.

While not addressing the issue of who would ultimately command air support units, TC 52 stated: “Air units designated as a portion of a ‘Task Force’ are under the

control of the task force commander.”²³ This wording was used in anticipation of the Louisiana maneuvers where an air task force (ATF), “a temporary organization analogous to the air support command (ASC),”²⁴ supported each of the corps and armies. The air support commander determined aircraft availability and mission suitability, whereas target selection and decisions would be “in conformity with the directive furnished by the supported ground commander.”²⁵ Thus, TC 52 treated supporting attack aviation essentially as long-range artillery. Attack aviation supported ground operations by “extending the range and hitting power of organic means,” and consistent with FM 1-5 and 1-10, airpower should be “reserved for employment on targets which cannot be engaged effectively or overcome promptly by the use of artillery alone.”²⁶ TC 52 also included all aircraft types in the ground support role, reflecting the plan to use dive-bombers and pursuit aircraft, while still identifying light bombers as “particularly trained and equipped to operate in close support.”²⁷

With the introduction of the “advanced air support command post” and associated procedures, TC 52 advanced the interaction between tactical air and ground decision makers, solidified communications, and facilitated flexible air support control. An installation set up with the supported unit command post, the advanced air support command post was to be highly mobile and manned by air and ground commanders to request, evaluate, and control air support missions requested by ground combat elements.²⁸ If a request was approved, the air commander would order via telephone, teletype, or radio, alert aircraft to execute the mission.

TC 52 produced three other tactical communication concepts: a standardized target request format, a radio communications link between the ground party and

attacking aircraft, and the use of observation or reconnaissance aircraft to aid target acquisition by attack aircraft. In the communications intensive environment of CAS, TC 52's preformatted air support request made great strides in the area of brevity. Its elements: (1) designation of target including location by coded template, (2) time of attack, (3) bomb safety line location, (4) special instructions, and (5) time signed, shortened message length and expedited transmission, while increasing receiver comprehension.²⁹

Equally significant was the concept of ground elements in radio contact with attacking aircraft. Expanding on FM 1-10's discussion of armored force-aircraft contact, TC 52 added other categories of ground units to the list requiring radio contact. Demanding compatible radios and frequencies, the proposed system prompted attempts to standardize terminology and procedures. Observation and reconnaissance aircraft roles in CAS revealed themselves, yet remained undeveloped. Despite a specified task to report to the advanced air support command post changes in target disposition and attack results, and the advanced mission to "assist in orienting the attacking forces on the target" when properly equipped, TC 52 failed to direct a radio link between the observation and attack aircraft.³⁰ The advanced air support command post and its new procedures, strong and weak alike, would be tested in just twenty-seven days.

The Louisiana maneuvers began 15 September 1941 and ran for two weeks. The Second ATF in support of the Second Army consisted of a pursuit command and an ASC (once again, the renamed 17th Bomb Wing), with the Second ASC utilizing six AAF bomber squadrons: three medium, two light and one dive, plus one each of Marine Corps and Navy dive bomber squadrons.³¹ Designed to test and evaluate the emerging air-

ground cooperation system, air planning drew on many sources, including the British “Close Support Bombing Directive” dated 6 December 1940, guidance from Major General Lewis H. Brereton on close and direct support, the Armored Force Test and Training Board at Fort Knox, Kentucky, and the Command and General Staff School at Fort Leavenworth, Kansas.³² TC 52’s influence on the exercise was mainly procedural; specific terminology differed slightly due to the Second ATF plan predating the circular by ten days.³³

While planning reflected doctrine, execution proved logistically difficult, and air request procedures experienced growing pains. The ATF maintained centralized command and control of its two subordinate commands, yet the ASC HQ did not collocate with Second Army HQ. This initial flaw, a product of operating at home station, caused problems with liaison and maximizing airpower use for the exercise duration. Airpower was reserved for two primary missions, “direct support” defined as “air action to isolate the battlefield,” and “close support,” defined as “the intervention of air forces on the battlefield.” All possible intermediate links in the air request chain were eliminated and published guidance required aircraft targets to be “inaccessible to artillery.”³⁴ By eliminating high-level coordination, the system lost the oversight of commanders with a larger view of the “war,” and negated the ability to mass airpower at decisive points. The consequence of the strict target selection guidance was that “few targets materialized . . . which could be deemed suitable” for close support operations. Therefore, multiple untasked sorties per day were used for reconnaissance purposes, which did not generate complex close support missions, but the simpler direct support missions. When airpower did execute close support missions, the system proved capable, averaging 1 hour,

26 minutes from demand to attack by ground alert aircraft.³⁵ With the majority of sorties executing direct support, pilots became increasingly comfortable and proficient at that mission, highlighting to airmen the value of interdiction.

The TACS in Louisiana began with an air support control, located at ATF headquarters and supervised by the ATF Commander, which received support requests via radio from one of five air support demand units. Located mainly at division level, Air support demand units were manned by air liaison officers (ALO) who advised ground commanders on air matters and appropriate targets.³⁶ Radio and telephone nets still needed research and development, as indicated by failed attempts to make radio contact between attacking aircraft and the air support demand unit for updated target information. These attempts “proved very unsatisfactory” due to the incompatibility of the fielded radio sets, combined with limited frequency availability.³⁷

Overall, the Louisiana maneuvers were considered beneficial for both air and ground forces. Recommendations in the Second ATF final report included: educating ground commanders on the use of airpower; educating ground commanders on ALO capabilities (many of the ALOs reported they were never consulted on air support use); and improving air support control mobility to facilitate movement with the ground headquarters.³⁸ Unfortunately, there would barely be time to address improvements before the next major combined arms event began.

Conducted from 16 to 30 November 1941, the Carolina maneuvers would be the last major military exercises conducted prior to America entering World War II. With emphasis on opposing ground forces, only ASCs were generated, the First and Third being assigned to opposing armies. Given the similarity to the Louisiana exercises, not

surprisingly the lessons learned were similar as well. Support missions flown included air superiority, interdiction, close support, and transport, with the 99 of the 167 missions being interdiction, and only 31 against “miscellaneous” targets that included close support against frontline troops.³⁹ Significant new information on the continuing communications problem came to light via one ALO’s after action report, defining both system shortfalls and requirements:

All ground radio sets now available for air support work appear to be completely unsatisfactory. The SCR 197 set, used for communication between the air liaison officer and the supporting airplane unit was useless due to its immobility and time required to stop and put the set into operation. The SCR 193 set . . . does not have adequate power and range . . . What is needed is a powerful radio set with a range of 200 miles, mounted in a mobile four wheel drive vehicle, and capable of operating while traveling. . . . Air-ground voice communication immediately prior to attack of the objective is believed to be vital due to the rapidly changing situation.⁴⁰

The final report released by Air Force Combat Command reflected lessons and recommendations from both exercises, and were similar to previous conclusions.⁴¹

Just four days after the conclusion of the Carolina maneuvers, Air Force Combat Command supplemented its training instructions for air support aviation for the next six months. Expectations were specific and directly reflected the lessons learned in Louisiana and the Carolinas. Air support commanders were now “expected to develop tactics and techniques” for use as air support doctrine. It demanded each ASC commander, plus two officers per group staff and one officer per squadron be trained and ready for liaison duties, ensuring experienced ALOs would be available to support ground commanders. Communication procedures were listed in detail, and light and dive bomber units were instructed to train to “the limit of current ammunition allowances” for attacks “with

particular attention to delivery of an accurate attack with minimum preparation,”⁴² the situation found in most CAS scenarios.

On 3 December 1941, at a meeting called by Secretary of War Henry L. Stimson to discuss the maneuvers, Major General Leslie McNair, Army GHQ Chief of Staff commented with Major General Arnold’s concurrence, that “cooperation between air and ground elements had shown improvement, but . . . a great deal of work remained to be done in the development of tactics and techniques.”⁴³ Major General Brereton noted in his diaries that in the maneuvers “the ground forces for the first time . . . demonstrated a reasonably accurate assessment of airpower.”⁴⁴ McNair and Arnold proposed more exercises to refine tactics and techniques, but unfortunately, these were overcome by the events at Pearl Harbor.⁴⁵

TC No. 70, *Basic Doctrine*, released 16 December 1941, superseded FM 1-5, significantly impacting air support thought. Despite CAS falling to sixth in mission priority (number one was now denying the “establishment of hostile bases in the Western hemisphere,” and number two the attack of enemy air bases and forces),⁴⁶ the urgency of war and awareness of current capabilities was clear in the emphasis placed on joint air-ground training. “Training for close support requires carefully coordinated plans by both the ground and air units concerned. . . . The two-way obligation for this type of training will not be minimized.”⁴⁷

TC 70 continued to compromise on organization and command and control by contradicting itself on the issue. Guidance in separate chapters stated: “All combat aviation in a theater of operations will be retained under central control . . . whether for close support or independent missions” and “air support is assigned by the theater

commander to the major elements of attacking ground forces.”⁴⁸ This fundamental issue remained unresolved until operations in Tunisia forced theater leaders to make difficult decisions on the control of airpower.

TC 70 maintained the concept that airpower should be employed against concentrated and easily located targets in the enemy rear area, rather than against smaller, dispersed targets on the battlefield. This interdiction bent meshed well with experiences from the maneuvers and the notion that “air support should never be called for if other firepower is available and able to accomplish the desired ends.”⁴⁹ As for CAS, TC 70 expanded the mission to all types of combat aircraft, stating “all combat aviation would be trained within its means to provide effective air support to ground forces.”⁵⁰ No longer the exclusive domain of light bombers and fighters, medium and heavy bombers could expect CAS tasking as well.

AAF basic doctrine finally published the requirement for a tactical air control system in TC 70. Considering the results of the previous year’s training maneuvers, it stated: “To a large degree the effectiveness of close support is measured by the speed with which support can be obtained. Thus training must be directed to reduce to the minimum the time required to deliver an attack after a call for support has been sent. This involves a simple and direct system of communication and training in air-ground communications.”⁵¹ Unfortunately, the measure of success used was response time versus effects delivered. In the effort to reduce response time, the system defined here and in the coming FM 31-35 divided scarce air resources, wasted effort on low priority missions, and left airpower impotent to exploit its inherent flexibility or to mass at different places and times for maximum effect.

FM 31-35, *Aviation in Support of Ground Forces* (9 April 1942), superseded TC 52, TC 70, and “any other doctrines and training methods in conflict” with it,⁵² and represented a “crash effort to establish a comprehensive system of air support.”⁵³

Although its authors wrote the manual understanding it was highly tentative and subject to change,⁵⁴ and that combat experience would be needed to validate the doctrine,⁵⁵ the manual was applied nearly verbatim as the AAF struggled to build basic skills, with “little thought beyond what was contained in the manuals.”⁵⁶

After tacitly declaring support aviation to be under command and control of the ASC commander, FM 31-35 quickly deferred actual control to the ground force commander. The air support commander was simply an “advisor to the ground commander,” who was the final decision-maker on targeting.⁵⁷ Stopping short of requiring aviation support unit allocation to specific ground units, the manual allowed the practice and detailed the advantages. The force that emerged listed ground units with exclusive tasking authority over specific aircraft at specific bases, with the aircraft unit commander often excised from the operational chain of command.⁵⁸ Lastly, FM 31-35 allowed the complete removal of aviation units from the air command structure and attached directly to subordinate ground units. This flawed organizational plan ignored existing British doctrine “developed and so successfully tested in battle by the Eighth Army-RAF . . . partnership in the Western Desert.”⁵⁹

Given its focus on air support, FM 31-35 did not expand on other airpower missions, and maintained the now standard concept that targets were not to be selected within the effective range of ground force weapons.⁶⁰ Rather, it focused on the need for highly effective teamwork through collocated air support and ground command posts and

for ALO attachment to lower echelon ground units for the specific purpose of evaluating, processing, and transmitting air support requests, then controlling the attacks. These liaisons used personnel and radio equipment supplied and maintained by an air force communications squadron.⁶¹

FM 31-35 described, in general operational terms, a system where a ground unit in need of air support, could request it via air force channels--air support parties (ASP) and air support controls--subsequently receive that support, and have the means to control it. The manual placed great emphasis on experienced air officers equipped with aircraft-compatible communications gear. An air support control was defined as the “air unit at the headquarters of the supported unit for the purpose of controlling the operations of the support aviation; advising the supported ground commander as to the capabilities of the air unit; and maintaining liaison with the air units.” Normally located at corps level, the air support control “always” had direct radio contact with its subordinate ASPs, and had direct contact with the combat aviation unit providing support. It evaluated requests from the ASPs, and decided with the ground force commander whether to fill the request. Unfortunately, the system bypassed the ASC HQ (with their larger view of the war) in the quest for improved response time.⁶² This practice used sorties for lower priority tasks instead of the theater priorities. Additionally, the extensive requirement for radio equipment between air support controls, ASPs, airfields, and aircraft relied on an overwhelmed communications squadron to provide those links.

Despite sincere AAF efforts to benefit from lessons being learned from British combat experience, air support doctrine from the Middle East did not transfer to Allied training, doctrine or plans for North Africa. Immediately after President Franklin D.

Roosevelt declared a limited state of national emergency on 8 September 1939 General Arnold sent observers to England to monitor British plans, doctrine, and execution. First to go were Majors Carl Spaatz and George Kenny, who would later command US Air Forces in the European and Pacific theaters, respectively. Arnold sent additional officers in 1940, and later that year in May established the Special Observer Group in London to keep abreast of significant tactical and technical developments.⁶³ Unfortunately, distance, independent thinking, and AAF concern for air superiority and long-range bombing inhibited learning in CAS. ACTS instructors believed and taught that German airpower successes validated US air theory, but their conclusions were reached concerning unified control of the air force, achievement of air control, and isolation of the battlefield, not on the German ground support system.⁶⁴

Arnold himself went to England in April 1941 to learn British aircraft, troop, basing, and ground support plans. While the majority of his meetings were strategic in nature, meeting with King George, Prime Minister Winston Churchill, and RAF Commander Air Chief Marshall Sir Charles Portal,⁶⁵ Arnold also met with tactical level leaders. Briefed on the British ground support system contained in their “Close Support Bombing Directive,” Arnold brought it back to America for use in the Louisiana Maneuvers.⁶⁶ In March 1943 Air Marshall Sir Arthur Coningham, then commander of the Northwest African Tactical Air Force, sent two experienced RAF wing commanders to the AAF School of Applied Tactics to pass on experiences from the Western Desert Air Force (WDAF).⁶⁷ Unfortunately, this education took place after painful lessons learned from November 1942 to February 1943 had already elicited change. Coningham’s influence on American doctrine might have begun in June 1942 when American units

first flew in air-ground combat under his command, yet distance and communication methods of the day proved to be significant obstacles. Coningham's desire for the Americans "to profit by all our mistakes and by our successes"⁶⁸ had not extended beyond the Middle East.

In June 1942, a handpicked detachment of American B-24s arrived in the Middle East to fight with the established British forces.⁶⁹ On 24 July, the first American fighter group arrived in theater to join the Allied forces and was eventually absorbed into Major General Lewis Brereton's US Middle East Air Force (MEAF).⁷⁰ While nominally an organization independent from the British WDAF, the MEAF actually fought under British direction and was "carefully mixed in with RAF squadrons until it was sufficiently experienced to operate on its own."⁷¹

Brereton, pressed into service in the Middle East on 23 June 1942 following the British Eighth Army's full retreat from German Field Marshall Erwin Rommel's Afrika Korps, was impressed with Coningham's WDAF support of the British Army during the withdrawal. He attached a colonel to Coningham's command post to learn "desert fighter-bomber techniques in direct support of the ground forces," and to comprehend the liaison system between the Army and RAF.⁷² Brereton's assessment of the operation indicated the British had solved problems Americans were still wrestling with, primarily by establishment of an independent, coequal air force supporting the theater ground force.

The primary mission of the Western Desert Air Force is to cooperate with the Eighth Army. It exists for the sole purpose of supporting the ground forces. Its broad plan of employment is first to defeat the enemy air forces and maintain air supremacy. The next and equally important task is to assist in the ground operation by destroying enemy troops, artillery, transport and supply. . . . Wherever his resistance on the ground threatens our attack . . . air forces are

available to him on request. The intercommunication between ground and air . . . and the mutual confidence between the two make for an unbeatable team.⁷³

Coningham described the effective British command relationships on 16 February 1943 in a speech to senior Allied leaders in Tripoli, explaining the highly successful system used by the WDAF. “The Soldier commands the land forces, the Airman commands the air forces; both commands work together and operate their respective forces in accordance with the combined Army-Air plan, the whole operations [*sic*] being directed by the Army Commander.”⁷⁴ In the Middle East in August 1942, the overall theater commander was British General Harold L. Alexander, his counterpart commanding RAF, Middle East was Air Chief Marshall Sir Arthur Tedder. General Bernard L. Montgomery commanded the Eighth Army, and Coningham served as WDAF commander, charged with cooperating with Montgomery’s Army, and enjoying coequal status. Montgomery and Coningham maintained a “joint air-ground headquarters where they worked toward a common goal, neither commanding the other’s forces, yet each cognizant of the other’s requirements.”⁷⁵ Brereton briefed Arnold on the importance of the British command arrangement, and how cooperation came about from a “natural sympathy and understanding between the air and ground commander.”⁷⁶

WDAF air-ground cooperation techniques were advanced well beyond what American doctrine described, involving liaisons from the commander down to the lowest execution levels. Liaisons explained air methods to soldiers and army methods to airmen, explaining not just why things went wrong, but what to do to fix them.⁷⁷ The air support control at Coningham’s headquarters had both army and RAF radio operators taking and evaluating air support requests, with approved requests passed to RAF units for action.⁷⁸ Control of air support requests at the highest level ensured maximum airpower impact at

decisive points. Although highly effective, the WDAF system was not perfect. Much like the Americans, the British found communications to be the limiting factor to effective support.⁷⁹

The British victory in the battle of Alam Halfa in late summer 1942 provided an excellent example of effective air-ground support. On 30 August, Rommel launched an attack against the Eighth Army's southern flank intent on driving north to take Alexandria, Egypt. Through six days of intense desert warfare, Allied combined air and ground forces stopped the Axis advance, defeating Rommel and his Afrika Korps. MEAF participation including air superiority sweeps, interdiction attacks on supply facilities and transport, and concentrated air attacks on frontline forces.⁸⁰ The established command arrangements allowed for air forces to be flexibly committed in conjunction with the land force plan, ultimately achieving victory.⁸¹

In General Arnold's view, MEAF aircrew coordination with Coningham's Western Desert command "provided an invaluable experience for our American crews."⁸² The system used was not in accordance with published AAF doctrine, but what had been found effective in combat. When possible, AAF leaders sent tactics back from North Africa, but the ability to assimilate those in manuals for distribution proved limited. Similarly, RAF and AAF HQs in the US and England had difficulty disseminating doctrinal changes to personnel who would need to implement them in combat.⁸³ In effect, once the war began, parallel doctrine development process took place. In Washington, at the ACTS, at the AAF School of Applied Tactics, and in London, leaders developed methodologies via theory and war-gaming, with limited input from observers and combat experience. Combat leaders developed tactics based on experience and what was proven

valid and suitable. They developed valid situational doctrine due to wartime necessity, tangible results measured in responsiveness, effects, and lives; as well as their distance from formal centers of doctrine development.⁸⁴ Eisenhower's Allied Force Headquarters (AFHQ) planners developing the invasion of North Africa discarded the WDAF model for a number of reasons including overconfidence in their untested system (FM 31-35), and the failure to effectively transfer airpower lessons between theaters.⁸⁵ Subsequent changes in command structure and subsequent redefinition of airpower roles in Tunisia were installed because "men who had learned the hard way in the Western Desert--by trial and error--would insist upon them."⁸⁶

Two major pieces of formal doctrine were released during this time period (late 1942 to early 1943) although only one of significance. A revised FM 1-5, *Employment of Aviation of the Army*, was released on 18 January 1943, which merely incorporated the air control system architecture of FM 31-35, even as those methodologies were being proven ineffective. Of greater significance to airpower and setting the stage for effective use of CAS, was FM 100-20, *Command and Employment of Airpower*, which superseded the obsolete FM 1-5 on 21 July 1943.

The air support plan for the invasion of North Africa was flawed from the beginning. Operation Torch used use a combination of FM 31-35 and Eisenhower's own directive to create the air force organization. Organizational defects cascaded into airpower misuse by ground commanders who possessively thought they could use airpower like a ground maneuver unit. Other factors influenced the relatively poor performance of airpower during the winter of 1942-1943 as well. A shortage of suitable aircraft and all-weather airfields, unexpectedly poor weather, and dismal logistical lines

in the face of a determined enemy made operations extremely difficult. On a positive note, liaisons use flourished, and the ASP system proved worthy. As predicted, timely, effective radio communications proved a critical limitation.

In October 1942 Torch planners at AFHQ issued an operations directive attempting to clarify the close support plan for the upcoming invasion. In “Combat Aviation in Direct Support of Ground units,” planners established command relationships along the lines of FM 31-35, stating the Allied force commander could allocate air support units to his task force commanders, who could in turn further divide air units among individual task force elements. As a result, division or combat command (task forces within an armor division) commanders controlled significant numbers of aircraft for their exclusive use.⁸⁷ Since the ground commander decided air support missions and methods, there was high potential for commanders to hold scarce aircraft on the ground in reserve, in ineffective defensive air patrols, or in costly airborne alert status to “minimize the time lag between requests for missions and their execution.”⁸⁸ These methods were inconsistent with the words of caution ending the directive: “Support aviation must neither be dispersed nor frittered away on unimportant targets. The mass of such support should be reserved for concentration and overwhelming attack on important objectives.”⁸⁹

The directive should have reflected Winston Churchill’s policy established a year earlier on 5 October 1941. In response to British interservice fighting over the role of ground support aviation, specifically the use of continuous defensive air umbrellas over ground forces, Churchill settled the matter by decreeing: forces should be “organized on the Libyan [WDAF] Model, which all sides admitted was extremely effective.”⁹⁰ This

model, as discussed above, favored centralized control, coequality, and air strikes en masse on ground targets of great importance, while prohibiting air umbrellas.

Operations Torch organization directly opposed the airpower precept of centralized control. The invasion's three separate task forces--Western (WTF), Central (CTF) and Eastern (ETF)--were each supported by an attached force for air support. The American WTF and CTF had American Twelfth Air Force (12 AF) support, divided into the Twelfth ASC supporting Patton's western landing in Casablanca, and the Twelfth Bomber and Fighter Commands supporting Fredendall's II Corps landing at Oran. In the British ETF, the RAF Eastern Air Command (EAC) provided the support. The organizational command structure "reflected the central weakness of the entire operation."⁹¹ With no central air commander, and no coordination links between 12 AF and the EAC, each would organize and plan independently to support their ground commanders.

Hastily organized, 12 AF was unbalanced in capabilities and missions among its commands. FM 31-35's convention of organizing an air force along functional lines (bomber, fighter and air support) was used, but the whole was then divided to support separate task forces. Bomber command was equipped with longer range, multiengine, level bombers and had limited escort fighter capability, while the fighter command primarily dealt with the pursuit mission of air superiority. Doctrinally, there was no provision for air support controls or ASPs within the bomber and fighter commands, as there was in the ASC supporting the WTF. Yet each task force would rely on its assigned aircraft for CAS as well as air superiority, interdiction, and reconnaissance. Not until the WTF and CTF recombined to form the Fifth Army did 12 AF capabilities reunite.⁹²

In an ironic twist, 12 ASC aircraft did not participate in the invasion or in the subsequent three days of fighting before Casablanca fell. Naval aviation executed CAS missions until 12 ASC HQ was established on shore two days later, and the first 12 ASC aircraft arrived between D+2 and D+4. Naval aircraft did a credible job responding to calls for air support while combating the light French Moroccan Air Force and Navy. Twelfth ASC ASPs did manage to participate, employed both as assault infantry and calling for naval air support.⁹³

While the 12 ASC languished offshore, air elements of Fredendall's CTF demonstrated combat improvisation, devising their own air control system to call for air support. Operating from the Oran airfield of Tafaraoui, the commander of the 31st Fighter Group had received harassing fires from French artillery since he and his squadron had arrived. Lacking an ASP, he managed to contact the naval flotilla command ship *Largs*, first by using the radio in an armored division command tank, and later by using an aircraft radio. Available fighters filled the relayed support requests and silenced the offending artillery.⁹⁴

Over the next three months many factors conspired to hamper Allied efforts, both in the air and on the ground. Poor weather severely restricted air operations and rain made unimproved airfields hazardous to use. Long distances from friendly airstrips to the front limited time available on station (sometimes to just five or ten minutes), and increased response time for aircraft on ground alert. Enemy fighters and bombers were based much closer to the front at all-weather airfields, and evaded Allied fighters by flying out of range, or landing until the aircraft departed. Heavy rains led to muddy roads and severe conditions, hampering logistical resupply of forward air and ground units.

However, the most significant limitation to airmen was the misuse of airpower by ground force commanders. Concern that ground commanders may “fritter away” their air assets was well founded and had a demonstrated effect on combat operations.

Air Force doctrine, reflected in FM 1-5 (1940) and FM 31-35, held that “local air superiority must be maintained to insure air support without excessive losses due to hostile aviation.”⁹⁵ This precept translated into 12 ASC objectives while in support of Fredendall’s II Corps. For the period 13 January to 14 February 1943, those objectives were:

- (a) To gain air superiority in the II Corps sector in so far as possible with the limited number of aircraft available;
- (b) To support the friendly ground forces directly by:
 - (1) Reconnaissance over the entire front and flanks;
 - (2) By attacking enemy ground movements and concentrations located by aerial observation;
 - (3) By attacking targets requested by our Air Support parties;
 - (4) To provide photoreconnaissance whenever equipment was available;
 - (5) And to provide a maximum of protection to our ground units from enemy air attacks.⁹⁶

Objective (a), while paying lip service to air superiority, indicated the restrictions emplaced by Fredendall. It reflected how few aircraft were available for use, confining itself to the “II Corps sector,” suggesting that enemy attacks in adjoining sectors were a matter for the other sector’s airpower. Besides the incident involving the French XIX Corps, another incident occurred on 27 November 1942 when airpower from the CTF refused to assist the British First Army with a reconnaissance effort against attacking German forces.⁹⁷ The objectives further tell of the defensive role given airpower, as all

remaining corps aircraft were used in air umbrella fashion to protect the ground force. These goals, while including some doctrinal missions and priorities, demonstrated flawed plans for the use of limited air resources.

Further evidence of this misuse surfaced during a conversation between Allied Air Force commander Lieutenant General Carl Spaatz and Fredendall, recorded by Spaatz in a memo of 5 February 1943. Planning an offensive, Fredendall wanted aircraft flying over his troops for forty-eight hours prior to “protect them from German air and artillery.” Furthermore, he asked Spaatz to have bombs dropped on the front for his men to see and for an air-to-air victory in view of the troops for morale purposes. Spaatz could not convince the II Corps commander of the idea’s flaws or that the majority of airpower should be massed for air superiority and interdiction missions.⁹⁸ Spaatz departed with the issue unresolved; flawed organizational doctrine had opened the door for flawed ground support doctrine.

The effects on the battlefield were varied and discouraging. With no centralized air superiority effort, German aircraft extracted severe tolls on Allied air operations. The 12 ASC suffered crippling losses due to enemy fire: of eighty-three aircraft available on 13 January 1943, twenty-five were lost to German fighters and seven more to anti-aircraft artillery by 14 February, a forty percent loss rate.⁹⁹ The 33rd Fighter Group, down to just thirteen aircraft in two squadrons, withdrew from the theater for reconstitution.¹⁰⁰ In the words of Colonel William W. Momyer, group commander at the time:

Both [including the RAF 242 Group supporting the British 1st Army] of these air forces were trying to provide close air support before obtaining air superiority. Consequently the German Air Force . . . controlled the air in northern and southern Tunisia. . . . Ironically--but naturally--not only had allied airpower failed

to achieve air superiority, but they had failed to provide the close air support that the Commanding General of the 1st Army and II Corps had desired.¹⁰¹

It did not take long for General Eisenhower to recognize the need for change. He received counsel from Air Marshall Tedder based on his observations during a visit to Algiers in November 1942. Tedder reported that Doolittle's 12 AF and the British EAC were not communicating or coordinating their efforts, observing: "The US Air [Doolittle's 12 AF] was running a separate war."¹⁰² Comprehensive fixes would not be instantaneous, but phased over a period of several weeks during January and February of 1943, incrementally adding layers of control above the air units, removing air forces from ground force control, and combining the Northwest African and Middle East forces. The resulting synchronized organization, with its influx of highly qualified and respected British leadership, resolved the troubled air-ground command relationships.

On 5 January 1943, Eisenhower reorganized the air forces by placing Major General Carl A. Spaatz, in command of the new Allied Air Forces. Combining the American 12 AF and British EAC efforts gave inactive and underutilized 12 AF units in Northwest Africa new life. A second benefit hoped for was that a single air leader would inspire greater effort to correct existing infrastructure, logistical, and apportionment problems. Unfortunately, with no central direction provided for the air support forces, the practice of attaching air support directly to ground forces continued; the 12 ASC was now attached to Fredendall's II Corps.¹⁰³

Airpower continued to disappoint Eisenhower during offensive and defensive actions in mid-January (Fredendall's denial of air support to the French), so he made further changes. On 21 January 1943, Eisenhower appointed Brigadier General Laurence S. Kuter commander of all air support forces under the Allied Air Support Command.¹⁰⁴

This additional layer united 12 ASC and RAF 242 Group efforts in a temporary organization approved at the Casablanca Conference in January 1943.¹⁰⁵

Held 14 to 26 January, the Casablanca Conference allowed President Roosevelt, Prime Minister Churchill, and the Combined Chiefs of Staff to discuss the war and agree upon a new, unified command structure for Mediterranean forces. Unified command was required due to Middle East Allied Force success in pushing Rommel west towards Tunisia; with one command for all Allied air forces, a coordinated effort was possible. Eisenhower retained overall command of Allied forces, Tedder would command Allied air forces under the Mediterranean Air Command, and Spaatz would command the new Northwest African Air Forces (NAAF) beneath Tedder.

The NAAF now included the Northwest African Tactical Air Forces (NATAF) under the highly regarded Air Vice Marshall Coningham. The NATAF added the WDAF to the RAF 242 Group and the 12 ASC for ground support, replacing the Allied Air Support Command. Although the organization did not take immediate effect, and further examples of poor airpower application occurred, the groundwork had been laid for improved theater force support.

Coningham's reputation came endorsed by Alexander, commander of the new Eighteenth Army Group, and Montgomery, the British Eighth Army Commander. In the previously mentioned meeting of leadership in Tripoli on 16 February 1943, Montgomery and Coningham explained the Western Desert system and why it would work in the new organization. Montgomery published and handed out a pamphlet entitled *High Command in War* reflecting the essential nature of close operations between air and ground forces while Coningham amplified those remarks with his speech on air-ground cooperation.

The Army fights on a front that may be divided into sectors, such as a Brigade, Division, Corps or an Army front. . . . The Air Front is indivisible. The army has one battle to fight, the land battle. The Air has two. It has first of all to beat the enemy air, so that it may go in to land battle against the enemy land forces with the maximum possible hitting power. As a result of success in this air fighting our land forces will be enabled to operate virtually unhindered by enemy air attack and our Air Forces be given increased freedom to assist in the actual battle area and in attacks against objectives in rear.¹⁰⁶

Eisenhower and Alexander, with Tedder's and Spaatz's agreement, approved the new doctrine for use by the Allied air forces. On 14 February, a German attack into Central Tunisia--what would be their last major offensive in North Africa--accelerated the changes. Focusing efforts along the seams of the land force lines, Rommel inflicted heavy casualties on personnel and equipment and by 17 February, the 12 ASC had abandoned five forward airbases near Thelepte.¹⁰⁷ Hundreds of vehicles were lost in the Allied withdrawal, including an unsuccessful defense in the Kasserine Pass in Western Tunisia on 18 February. Allied air support, hampered by the loss of forward airfields, loss of supplies, disrupted communications, and poor weather was in disarray as Coningham took command on 17 February. His first order of business was to reprioritize the use of airpower.

Immediately discontinuing the use of defensive air umbrellas and exhorting the use of airpower in the offensive, Coningham declared: "An air force on the offense automatically protected the ground forces."¹⁰⁸ Two days later he issued a General Operational Directive stating: "The first objective was to gain air superiority" with a campaign against enemy radar installations, air forces and airfields. General Alexander ensured the plan's implementation by unequivocally removing control of air forces from his ground commanders.¹⁰⁹ After air superiority, the next mission was interdiction of enemy rear area movements and vehicles and personnel concentrations. The 12 ASC put

forth a maximum effort, with aircrews flying “to the limits of their physical endurance” during the subsequent counterattack that drove the Germans back through the pass.¹¹⁰

Following Kasserine, Allied operations changed to reflect the newly adopted air support doctrine. Twelfth ASC support for the II Corps’ Operation Wop, 16 March to 9 April 1943, reflected Coningham’s enabling priorities. Air objectives for the push towards Tunis emphasized air superiority as a precursor to effective close support.¹¹¹ Results of those efforts, notwithstanding the additional pressure placed on the Germans by the WDAF and British Eighth Army in the east, seemed to validate the concepts. The 12 ASC enjoyed a four-to-one kill ratio in air-to-air fighting, allowing the light bombardment and fighter-bomber forces to focus on retreating enemy concentrations, resulting in 14 tanks and 129 motor transports destroyed.¹¹² As the Allies continued to squeeze the Axis forces, 12 ASC successes increased. In the period from 10 April to 13 May 1943 (when the Axis forces surrendered), the 12 ASC maintained its four-to-one kill ratio; while its assault on enemy ground forces destroyed 47 more motor transports while conducting 1,659 fighter-bomber sorties in “very effective close support.”¹¹³

During these operations, ASC headquarters traveled with the ground command post, while air support controls and ASPs provided an abundance of experienced airmen to function as air advisors.¹¹⁴ Through close coordination of air and ground intelligence sections, daily updates on friendly positions and plans were posted on the 12 ASC situation map before each day’s first sorties. During daytime operations, liaisons transmitted every change in the front line by teletype or telephone, improving communications and situational awareness.¹¹⁵

With the reorganization came changes to the TACS. Division and corps commanders could no longer approve their own air support requests; Alexander's 18th Army Group and the collocated NATAF headquarters would now approve them.¹¹⁶ By centrally controlling the request chain, Coningham ensured aircraft would be used for the highest priority missions, and "none could be held in reserve for the future use of a currently inactive ground unit."¹¹⁷ Although the added coordination potentially increased CAS response time, the higher oversight ensured the support went to the right place at the right time.

Significant technical improvements were made in the communications arena as well. By 9 April 1943 the teletype, telephone, and radio situation began to be resolved as the 12 ASC reported each was highly satisfactory in daily operations. Each ASP, now equipped with an SCR-522 VHF aircraft radio modified for ground use, had quick, reliable communications with both reconnaissance and fighter-bomber aircraft. Real time identification of friendly and enemy positions as well as specific target designation was enhanced. Airbase command posts also had radios and could monitor the CAS frequency to enhance their battle awareness.¹¹⁸ The technological and equipment improvements over the first few months of 1943 significantly improved CAS execution.

Overall, American air support doctrine in FM 1-5 (1940), and FM 31-35 was tested during the North African campaign and found wanting. It was not until the establishment of centralized control of air forces on 17 February 1943 that effective close support began. When not "frittered away" and with leaders who understood the application and limitations of air resources, deployed air forces achieved air superiority, thus enabling close support. The concepts of command and control, and effective air

support could not be separated, and in June 1943, General George C. Marshall, US Army Chief of Staff, ordered the revision of Army aviation employment doctrine. Three weeks later the commissioned board, comprised of the AAF School of Applied Tactics commandant, the First ASC commander, and the armored force liaison officer at AAF Headquarters, produced FM 100-20, *Command and Employment of Airpower*, superseding FM 1-5 (1943) and all other existing publications whenever their contents conflicted.

A short fourteen page document, FM 100-20 primarily declared the air force coequal to the ground force and “control of available airpower must be centralized and command must be exercised through the air force commander” to fully exploit its potential. It set airpower priorities as: (1) achieve air superiority, (2) interdict the movement of hostile troops and supplies, and (3) participate in a combined effort in the battle area on the immediate front of friendly forces.¹¹⁹ The significance of FM 100-20 was in the complete removal of air forces from any non-airman’s control except the overall theater commander. In the eyes of airmen, preventing individual ground commander control would prevent further disasters, and enable effective air support.

For all the elements of FM 31-35 proven defective in combat, there were several excellent concepts validated. The use of ASPs and air support controls proved very effective, especially once centrally controlled and equipped with new radio and communications technology. Prearranged air support request formats expedited request transmission and clarified understanding. The use of well-placed liaisons reaped benefits in cooperation and enhanced mutual understanding.

Brigadier General Paul L. Williams, commander of the 12 ASC from 24 January to the end of North African operations was convinced the “organization of an Air Support Command based on the principles of FM 31-35, is sound and workable . . . with certain modifications.” The principle change he advocated appeared at the end of his assessment, when he stated: “the Air Commander must have the initiative in the air, the Ground Commander on the ground. There is no necessity or reason for an assignment or attachment of one force to the other.”¹²⁰ Those precepts, an almost verbatim repetition of Coningham’s dictums, were the enablers for the system employed in May in North Africa, and which would be fine-tuned in Sicily, Italy, and Northwest Europe.

Eisenhower realized the vision of the lower level ground commander did not extend beyond the local battle, and therefore did not reflect “the competing demands of individual commanders on a far flung battlefield.” He remarked that the new Mediterranean tactical organization “solved one of the most basic problems of modern warfare--how to apply airpower most effectively to the support of land operations.”¹²¹

¹Thomas H. Greer, *The Development of Air Doctrine in the Army Air Arm: 1917-1941* (Maxwell Air Force Base, AL: USAF Historical Division, Research Studies Institute, Air University, 1955; reprint, Washington, D.C.: Office of Air Force History, 1985), 113-114 (page citations are to the reprint edition).

²US War Department, Air Corps Field Manual 1-10, *Tactics and Technique of Air Attack* (Washington, D.C.: Government Printing Office, 20 November 1940), 119.

³US War Department, Air Corps Field Manual 1-5, *Employment of Aviation in the Army* (Washington, D.C.: Government Printing Office, 15 April 1940), 2.

⁴*Ibid.*, 21-23.

⁵*Ibid.*, 29-34.

⁶FM 1-10, 2.

⁷Ibid., 116.

⁸FM 1-5 (1940), 5; FM 1-10, 118.

⁹FM 1-5 (1940), 21-22.

¹⁰FM 1-10, 118.

¹¹David Syrett, *The Tunisian Campaign, 1942-1943*, in *Case Studies in the Development of Close Air Support*, ed. Benjamin Franklin Cooling (Washington, D.C.: Office of Air Force History, Special Studies, 1990), 167.

¹²FM 1-5 (1940), 22.

¹³FM 1-10, 118-119; Greer, 115.

¹⁴FM 1-5 (1940), 42-43.

¹⁵FM 1-10, 118-119.

¹⁶US War Department, Army Air Forces Field Manual 1-45, *Signal Communication* (Washington, D.C.: Government Printing Office, 4 December 1942), 33.

¹⁷US War Department, War Department Directive, "Air Corps Training, 1939-1940" (Washington, D.C., 16 June 1939), 1-2.

¹⁸Lee Kennett, *Developments to 1939*, in *Case Studies in the Development of Close Air Support*, ed. Benjamin Franklin Cooling (Washington, D.C.: Office of Air Force History, Special Studies, 1990), 52-53.

¹⁹Ibid., 53.

²⁰Headquarters Air Force Combat Command. "17th Bomb Wing (Light) Report on Combined Tests to Develop Doctrines and Methods for Aviation Support of Ground Forces" (Savannah Army Air Base, GA: 2 July 1941, photocopied), Record Group 337, National Archives, Records of the Army Ground Forces.

²¹Kennett, 53.

²²Headquarters GHQ Air Force, "GHQ Air Force Training Directive, 1941-1942" (Bolling Field, Washington, D.C., 1 June 1941, photocopied), National Archives Record Group 407, Records of the Adjutant General's Office.

²³US War Department, Training Circular No. 52, *Employment of Aviation in Close Support of Ground Troops* (Washington, D.C.: Government Printing Office, 29 August 1941), 7.

²⁴Christopher R. Gabel, *The U.S. Army GHQ Maneuvers of 1941* (Washington, D.C.: US Army Center of Military History, 1992), 57.

²⁵TC 52, 8.

²⁶*Ibid.*, 2.

²⁷*Ibid.*, 1.

²⁸*Ibid.*, 8.

²⁹*Ibid.*, 9.

³⁰*Ibid.*, 10.

³¹Headquarters Second Air Force, "Plan of Air Support of 2nd Army by 2nd Air Task Force" (Fort George Wright, Washington, 19 August 1941, photocopied), National Archives Record Group 337, Records of the Army Ground Forces.

³²*Ibid.*

³³Headquarters Second Air Force, "Plan of Air Support of 2nd Army by 2nd Air Task Force"; Headquarters Second Air Force, "Report on 2nd Air Task Force Participation in Louisiana Maneuvers, Combat Operations September 15-28 Inclusive," National Archives Record Group 337, Records of the Army Ground Forces, Entry 57, photocopied.

³⁴Headquarters Second Air Force "Report on 2nd Air Task Force Participation in Louisiana Maneuvers," 4-5.

³⁵Headquarters Second Air Force, "Plan of Air Support of 2nd Army by 2nd Air Task Force," 22.

³⁶*Ibid.*

³⁷*Ibid.*, 6.

³⁸Headquarters Air Force Combat Command, "Final Report on Employment of Aviation in Close Support of Ground Troops" (Bolling Field, Washington, D.C., 9 January 1942, photocopied), 1.

³⁹Gabel, 179.

⁴⁰Jack Roberts, "Report on Employment of Aviation in Close Support of Ground Troops" (Ellington Field, Texas, 30 September 1941, photocopied) National Archives Record Group 337, Records of the Army Ground Forces, Entry 57, 2.

⁴¹Headquarters Air Force Combat Command, “Final Report on Employment of Aviation in Close Support of Ground Troops,” 1-2.

⁴²Headquarters Air Force Combat Command, “Supplementary Training Directive, 1941-1942 for Air Support Aviation” (Bolling Field, D.C., 4 December 1941, photocopied) National Archives Record Group 337, Records of the Army Ground Forces, Entry 57, 1-9.

⁴³Gabel, 171.

⁴⁴Lewis H. Brereton, *The Brereton Diaries: The War in the Air in the Pacific, Middle East, and Europe, 8 October 1941-8 May 1945* (New York: William Morrow and Company, 1946), 4.

⁴⁵Daniel R. Mortensen, *A Pattern for Joint Operations: World War II Close Air Support North Africa* (Washington, D.C.: Office of Air Force History and U.S. Army Center Of Military History, 1987), 17.

⁴⁶US War Department Training Circular No. 70, *Army Air Forces—Basic Doctrine* (Washington, D.C.: Government Printing Office, 16 December 1941), 1.

⁴⁷*Ibid.*, 10.

⁴⁸*Ibid.*, 2, 8.

⁴⁹*Ibid.*, 8.

⁵⁰*Ibid.*, 3-4.

⁵¹*Ibid.*, 11.

⁵²US War Department, Basic Field Manual 31-35, *Aviation in Support of Ground Forces* (Washington, D.C.: Government Printing Office, 9 April 1942), 1.

⁵³Lee Kennett, *Developments to 1939*, in *Case Studies in the Development of Close Air Support*, ed. Benjamin Franklin Cooling (Washington, D.C.: Office of Air Force History, Special Studies, 1990), 56.

⁵⁴Robert Frank Futrell, *Ideas, Concepts, Doctrine*, vol. 1, *Basic Thinking in the United States Air Force, 1907-1960* (Maxwell AFB, AL: Air University Press, December 1989), 133.

⁵⁵Mortensen, *Pattern for Joint Operations*, 23.

⁵⁶Syrett, 157.

⁵⁷FM 31-35, 3, 10.

⁵⁸Ibid., 3.

⁵⁹Wesley Frank Craven and James Lea Cate, eds., *The Army Air Forces in World War II*, vol. 2, *Europe: Torch to Pointblank August 1942 to December 1943* (Chicago: University of Chicago Press, 1949), 137.

⁶⁰FM 31-35, 6-9.

⁶¹Ibid., 12, 35.

⁶²Ibid., passim.

⁶³Greer, 108, 109.

⁶⁴Ibid., 109.

⁶⁵Henry H. Arnold, *Global Mission* (London: Hutchinson and Co., Ltd, 1951), 140-150.

⁶⁶Kennet, 53.

⁶⁷Daniel R. Mortensen, *The Legend of Laurence Kuter*, in *Airpower and Ground Armies: Essays on the Evolution of Anglo-American Air Doctrine 1940-1943* (Maxwell AFB, AL: Air University Press, 1998), 119.

⁶⁸Vincent Orange, *Getting Together*, in *Airpower and Ground Armies: Essays on the Evolution of Anglo-American Air Doctrine 1940-1943*, ed. Daniel R. Mortensen (Maxwell AFB, AL: Air University Press, 1998), 24.

⁶⁹Wesley F. Craven and James L. Cate, eds., *The Army Air Forces in World War II*, vol. 1, *Plans and Early Operations: January 1939 to August 1942* (Chicago: University of Chicago Press, 1948), 341.

⁷⁰Brereton, 142.

⁷¹Orange, 4; Brereton, 141.

⁷²Brereton, 142.

⁷³Ibid., 143.

⁷⁴Craven and Cate, vol. 2, 164.

⁷⁵Ibid., 28.

⁷⁶Mortensen, *Pattern for Joint Operations*, 49.

⁷⁷Orange, 12-13.

⁷⁸Ibid.

⁷⁹Craven and Cate, vol. 2, 29.

⁸⁰Brereton, 150-151.

⁸¹Craven and Cate, vol. 2, 31.

⁸²Arnold, 185.

⁸³David R. Mets, *A Glider in the Propwash of the Royal Air Force?* in *Airpower and Ground Armies: Essays on the Evolution of Anglo-American Air Doctrine*, ed Daniel R. Mortensen (Maxwell AFB, AL: Air University Press, 1998), 57-58.

⁸⁴Thanks to Dr Christopher Gabel for the notion that increased distance from headquarters could inspire nondoctrinal methodologies.

⁸⁵Syrett, 160.

⁸⁶Ibid.

⁸⁷Mortensen, *Pattern for Joint Operations*, 50-51.

⁸⁸FM 31-35, 4, 11, 14.

⁸⁹Syrett, 159.

⁹⁰Mortensen, *Legend of Laurence Kuter*, 103.

⁹¹Craven and Cate, vol. 2, 53.

⁹²Mortensen, *Pattern for Joint Operations*, 53-55.

⁹³Craven and Cate, vol. 2, 74-78.

⁹⁴Craven and Cate, vol. 2, 73.

⁹⁵FM 31-35, 5.

⁹⁶Headquarters XII Air Support Command, "Report on Operations Conducted by XII Air Support Command, Tunisia: 13 January 1943-9 April 1943 (Headquarters XII ASC, 9 April 1943) AFHRA Reference number 651.3069-1, 1-2.

⁹⁷Arthur William Tedder, *With Prejudice: The War Memoirs of Marshall of the Royal Air Force Lord Tedder G.C.B.* (Boston: Little, Brown and Company, 1966), 370.

⁹⁸Syrett, 169.

⁹⁹Headquarters XII Air Support Command, “Report on Operations Conducted 13 January 1943-9 April 1943,” 3-4.

¹⁰⁰Headquarters VIII Air Support Command, “Interview with General Craig Regarding Air Support during African Mission,” 5 April 1943, AFHRA Reference number 533.451-7, 1.

¹⁰¹William W. Momyer, *Airpower in Three Wars (WWII, Korea, Vietnam)* (Washington, D.C.: Government Printing Office, 1978), 40.

¹⁰²Tedder, 370.

¹⁰³Craven and Cate, vol. 2, 112.

¹⁰⁴Mortensen, *Pattern for Joint Operations*, 67.

¹⁰⁵Craven and Cate, vol. 2, 140.

¹⁰⁶Mortensen, *Pattern for Joint Operations*, 76; Craven and Cate, vol. 2, 168

¹⁰⁷Headquarters XII Air Support Command, “Report on Operations Conducted 13 January 1943-9 April 1943,” 5; Craven and Cate, vol. 2, 155.

¹⁰⁸Craven and Cate, vol. 2, 157.

¹⁰⁹Syrett, 174-5.

¹¹⁰Headquarters XII Air Support Command, “Report on Operations Conducted 13 January 1943-9 April 1943,” 5.

¹¹¹*Ibid.*; Headquarters XII Air Support Command, “Outline Plan for Operation Wop” (Headquarters XII Air Support Command, 3 March 1943).

¹¹²Craven and Cate, vol. 2, 175.

¹¹³Headquarters XII Air Support Command, “Report of Tunisian Operations by XII Air Support Command, 10 April to 13 May” (Headquarters XII Air Support Command, 23 November 1943), AFHRA Reference number 651.306-1.

¹¹⁴Headquarters XII Air Support Command, “Report on Operations Conducted 13 January 1943-9 April 1943,” 2, 10.

¹¹⁵*Ibid.*, 13.

¹¹⁶Mortensen, *Pattern for Joint Operations*, 72.

¹¹⁷*Ibid.*

¹¹⁸Headquarters XII Air Support Command, "Report on Operations Conducted 13 January 1943-9 April 1943," 10-13.

¹¹⁹US War Department, Army Air Force Field Manual 100-20, *Command and Employment of Airpower*, in *Airpower and Ground Armies: Essays on the Evolution of Anglo-American Air Doctrine, 1940-1943*, ed. Daniel R. Mortensen (Maxwell AFB, AL: Air University Press, 1998), 178-179.

¹²⁰Headquarters XII Air Support Command, "Report on Operations Conducted 13 January 1943-9 April 1943," 24.

¹²¹Mortensen, *Pattern for Joint Operations*, 84.

CHAPTER 4

PERFECTING THE SYSTEM: JULY 1943 TO SEPTEMBER 1944

The release of FM 100-20 created substantial turmoil at AAF doctrine centers in Washington, D.C. and Maxwell Field, Alabama, while impacting combat operations to a lesser degree. Combat experience now drove official doctrine, not the other way around. Functional areas at AAF HQ took the secondary role of attempting to capture usable combat lessons. Characterized by bold tactical innovation, air operations in Sicily, Italy, and France continued its metamorphosis, using FM 100-20 as a guide, but not hesitating to make adjustments based on the tactical or operational situation. While missteps occurred, American air forces adapted, fine-tuning liaison and the TACS functions, while organization, command, and airpower roles stabilized.

FM 100-20's functional divisions--strategic, tactical, air defense, and air service--rendered the AAF School of Applied Tactics departments obsolete. In an 8 October 1943 reorganization the AAF Tactical Center was created to administer the AAF School of Applied Tactics and run a demonstration air force equipped with model strategic and tactical air forces and a model air defense wing.¹ On the same date, the AAF Board folded into HQ AAF, empowered to "develop tactics, techniques, and doctrines and to determine all military requirements for the Army Air Forces."² Despite a roster of over 200 personnel, the board's ability to produce doctrinal publications remained limited. Combat proven procedures would not be published until mid-1945 in preparation for an expected invasion of Japan.

Competition and mistrust between the US AGF and the AAF continued to delay doctrine publication. In April 1944, the AGF HQ refused to approve a draft TC entitled

“Air-Ground Cooperation,” citing overlap with FM 100-20 and employment impracticality. The AGF also resisted signing off on an AAF Board submission entitled “Tactical Air Force: Organization and Employment.” These two documents, considered essential by the AAF to replace the obsolete FM 31-35, were not released until the WD included enough compromises to publish them as TC No. 17, *Air-Ground Liaison*, on 20 April 1945, and TC No. 30, *Tactical Air Command: Organization and Employment*, on 19 June 1945. The interim voids left by the obsolete FM 31-35 and the controversial FM 100-20 (which was strong on organization, but weak on operations), left theater combat forces to develop their own air-ground cooperation techniques.³

Fortunately, Allied forces were proactive in making changes they thought necessary to accomplish the mission; in fact, the WD had a standing policy of soliciting suggestions for doctrine changes in organization and tactics.⁴ On 10 March 1944, Lieutenant General Mark W. Clark, commander, US Fifth Army, in coordination with Brigadier General Gordon P. Saville, commander, Twelfth ASC, recommended an air operations position (G3-Air) be added to all corps and divisions, and organic army signal companies be reorganized to provide air-ground liaison communication capabilities the air force squadrons had been providing. The WD implanted this nondoctrinal, combat driven recommendation nearly verbatim into TC 17 and official doctrine.⁵

Tactical doctrine during this period changed in much the same way, but rather than being published, it passed from pilot to pilot, unit by unit. In the Ninth Air Force there was “no standard book” on air-to-ground operations to pull out and study, just as there had been no official air-to-ground tactics manuals during training in the US. Lacking published guidance, each squadron commander decided the techniques to be

taught by his instructors and used in combat.⁶ Consequently, CAS techniques varied widely between units to accomplish similar missions, much the same as today.

Sicily was seen as a stepping-stone to the invasion of Italy. Allied air forces continuously attacked key targets in the weeks leading up to D-Day, 10 July 1943, planned and executed in accordance with the priorities established in FM 100-20. First achieve air superiority, then isolate the battlefield with interdiction, and lastly support ground forces with CAS. With increased resources and a fairly developed air support system, strengths and weaknesses of the close support system revealed themselves.

Air force organization for the Sicilian and Italian invasions--a strength--remained virtually unchanged from that developed in North Africa. All aircraft of the combined NAAF, including pursuit fighters and long-range bombers assumed tactical missions “to further the advance of our land and sea forces.”⁷ The existing command structure and leadership personalities allowed detailed focus on the air plan. Air commanders now planned operations independent of ground commander interference, yet that same separation also produced plans that were not “integrated in detail with ground and naval plans,”⁸ as demonstrated by the glaring absence of invasion day CAS. The air campaign overemphasized air dominance and interdiction, while CAS was scarcely mentioned.

NAAF forces conducted extensive offensive operations to gain control of Sicilian airspace beginning in February 1943, attacking airfields and ports, and targeting enemy aircraft in all mediums. Operations accelerated the week prior to Operation Husky, resulting in more than 1,000 Axis aircraft abandoned or destroyed and 139 planes shot down in air combat. On D-Day the Allied forces “dominated the air over Sicily.”⁹ Yet continued air superiority emphasis as Husky progressed, cost Allied forces CAS

missions. Concerned that Axis air attacks would focus on vulnerable landing forces, the NAAF flew more than 1,000 sorties in air patrols over the ships and beachheads, without CAS available for the first forty-eight hours.¹⁰ Even during a fierce German counterattack on 11 July, excess sorties executed interdiction missions, not close support; of eleven Seventh Army calls for CAS on 10 and 11 July, the AAF supported only one request.¹¹

Deliberate avoidance of coordinated planning at the highest levels also undermined the ability to coordinate at the tactical level. Airpower advisors without air support sorties were of limited usefulness to ground combat commanders. Liaisons did coordinate during four airborne drops in the campaign; however, limited available tactical air support reduced their effectiveness. Another serious miscue involved ground liaisons failing to “keep the ASC posted on the current location of bomb safety lines.”¹² This close support function required aggressive, daily attention to prevent the specter of fratricide.

The TACS system, improved from North Africa, had positive and negative aspects. Jeep mounted ground-to-air VHF radios expanded ASP mobility, while communications personnel gained great experience in equipment set up, operation, and maintenance. Yet close support sorties still responded too slowly for their ground force customers, and ASPs often had difficulty maintaining contact with higher headquarters and lacked experienced equipment operators.

Initial CAS unresponsiveness had two principle causes: first, overemphasis on air superiority and interdiction; and second, the distance CAS aircraft traversed to the front. FM 100-20's sequential priorities of air superiority, interdiction, then CAS, resulted in a

“phased” air campaign where the CAS phase was delayed until the first two were achieved. Minimal German air efforts met overwhelming Allied counterair forces as the mission imbalance failed to utilize economy of force. On the other hand, the massive air superiority effort did allow Allies to capture Sicilian airfields where friendly aircraft could operate closer to the troops, helping to solve some of the distance inhibitors. Gradually, conditions improved, and on 13 July (D+3), the first fighter squadrons landed in Sicily utilizing six captured airfields.¹³ The closer fields enabled more responsive air support for the Allies than had the fields of distant Tunisia, Malta, Gozo, and Pantelleria.

ASP use continued throughout Husky, although of limited initial success. On D-Day, four of five ASPs came ashore as planned, but had little success obtaining air support. Even when sorties became available, mountainous terrain blocked radio reception.¹⁴ During the remainder of the thirty-eight day campaign, rapid maneuvers and frequent stops accelerated ASP experience in the jeep mounted VHF radios. Using the SCR-299 for long-range ground communications and the SCR-522 for aircraft contact,¹⁵ ASPs validated liaison and communication networks, while technicians improved radio setup and maintenance proficiency.¹⁶

By Husky’s conclusion, several points were clear. The new air organization worked effectively and although close support for ground forces was de-emphasized, AAF commands supported the overall mission. Ground forces needed close support immediately during amphibious operations, thus CAS absence in the first forty-eight hours disturbed ground commanders watching the AAF plan independently. The Army’s official history stated, “the Allied Air commanders devoted little thought and attention to providing close air support to the ground forces during the campaign.”¹⁷ The detailed

planning and coordination that was crucial to CAS success needed immediate attention, as did ASP mobility and communication equipment and procedures.

As CAS operations moved to Italy, the extended period necessary to mature the theater proved valuable in further refining the close support system. Significant developments included precise coordination and planning between air and ground forces, extensive use of “on-call” CAS, evolution of the ASP into the “Rover,” and the introduction of “horsefly” airborne forward air controller (FAC(A)). These developments, products of relatively static front lines and combat lessons learned, ultimately became standardized in doctrine and execution.

Invasion planning and Husky execution occurred simultaneously, thus some of Husky’s lessons learned were not incorporated into the initial plan. The Operation Baytown and Avalanche amphibious landings received little to no close support for eleven days, until 14 September 1943. Prior to this point airpower focused on numbered Northwest African Air Force tasks: (1) neutralize the enemy air force by bombardment, (2) prevent the movement of reinforcements into the combat area, (3) provide air protection over the assault convoys, and (4) conduct drops of airborne troops.¹⁸ Though little CAS planning surfaced to this point, good news was on the horizon as the Fifth Army and Twelfth ASC commanders addressed air-ground cooperation needs.

Recognizing that synchronized air and ground plans enhanced effectiveness, Generals Clark and Saville developed a daily planning system used throughout the Italian campaign, starting by always collocating their HQs. The Army nominated targets for the next day that had filtered up from division and corps commanders at a daily 1800 meeting in the Army G-3 Air tent. Target suitability and effects discussions ensued, and

after considering guidance from higher air commanders on other air support needs, Saville submitted the targets to his staff for planning.¹⁹ These missions were considered “preplanned” and pilots executing them could expect to be briefed on the target description, coordinates, the latest bomb safety line, call sign and frequency of the appropriate ALO to contact, and possibly target area photos.²⁰

Improved coordination and planning significantly aided close support targeting and engagement, but the challenge of poor responsiveness remained. The use of “on call” CAS helped remedy this problem. During the same daily meeting establishing preplanned missions, Army leaders asked for a certain number of sorties be made available for “emergency targets.” Made possible by nearby airfields, local air superiority, and the relative surplus of fighter-bomber aircraft in theater, these sorties responded to CAS requests, often within thirty minutes.²¹ If no on call sorties remained, the new target’s priority was compared to others scheduled for attack that day. If of sufficient priority, the 12 ASC could divert airborne aircraft, or request support from the Mediterranean Allied Tactical Air Forces, who might possibly support the requested mission.²² Highly developed, this planning and execution system significantly differed from the North African system, greatly enhancing Allied force operations throughout the Italian campaign and beyond. The TACS of today bears striking resemblance to this system.

Contrasting with the Sicilian effort, “Rovers,” the new moniker for ASPs, used theater-seasoned aviators as strike request decision makers and controllers. Operating in pairs with additional radio equipment operators, primary Rovers had to be “highly experienced in combat, be squadron [commanders], and hold the rank of major or above,” while the assistant controller had to be a highly experienced combat flight leader.²³ Able

to convey target and battlefield awareness to pilots from an aviator's perspective, they selected appropriate targets, requested appropriate ordnance, and communicated using terminology and references the attacking pilots understood. Experienced air officers also conveyed a sense of confidence over the radio, which in turn inspired confidence in the flyers who often recognized the Rover's voice as that of a previous commander.²⁴

Rovers continued to evolve their aircraft control tactics. Using jeep or truck mounted SCR-522 radios, they scouted hilltops or other high ground as forward observation posts to obtain the best battlefield view and radio range. When a ground unit transmitted an air support request, Rovers radioed the request up to Army HQ via the air force operated communications net. If intermediate level ground commanders disagreed with the request, they simply disapproved it verbally, offering their rationale or alternate solution. If the request was approved, Rovers contacted a formation of loitering "on call" aircraft that were waiting for a target to strike. When more aircraft became available, a system called "Cabrank" emerged, with a new flight of attack aircraft arriving on station every thirty minutes. Rovers then directed pilots to the target by referencing significant terrain features or prebriefed reference points, or by marking the target with colored artillery smoke.²⁵ In this way, Rovers facilitated rapid attack on enemy targets while protecting friendly forces on the battlefield.

Another tactic for expediting attack was the FAC(A), called a Horsefly in the Italian theater. An airborne extension of the Rover controller, these small two-seat L-5 aircraft manned by an AAF pilot and army observer, orbited and observed target areas for extended periods. With an airborne view of the battlefield and greater radio range than the Rover, the Horsefly team found troublesome targets out of the Rover's view,

requested air support, and then led the attack aircraft to the target.²⁶ He then identified the target using techniques similar to the Rover, or (later in the war) marked the target himself using rifle grenades.²⁷ The Horsefly, a product of air superiority and intensive air-ground cooperation achieved since February 1943, was a significant development in close support doctrine.

While Italian operations continued, the Allies prepared throughout the winter and spring of 1943-1944 for the invasion of France, Operation Overlord. Gathering leadership, massing forces, and planning organization and strategy fell to the Combined British and American Chiefs of Staff and General Dwight D. Eisenhower, the Supreme Headquarters Allied Forces Europe commander. The long-awaited invasion applied many lessons learned from past operations, yet also incorporated elements seemingly contrary to combat experience. The invasion and Operation Cobra's subsequent breakout from the French St.-Lô area highlighted three key doctrine changes. First, the airpower organization and command relationships differed from those laboriously developed in North Africa and executed in Sicily and Italy, with no single air commander controlling all air forces. Second, CAS missions emerged as a primary airpower function as escort of individual armored columns was introduced. Lastly, the tactical air control system was refined to a level of efficiency not previously seen.

FM 100-20 called for the air force commander and the ground force commander to be "coequal," with neither being subordinate to the other. It also emphasized the need for a single air commander to maximize the coordination and synchronization of the air campaign with the ground component plan. American and British forces typically demanded these precepts, yet Overlord and Cobra divided airpower between two air

commanders under Eisenhower due to leadership personalities and national interest differences. Allied air forces operated outside of the doctrinal concept of centralized control, yet still achieved tremendous success.

The air command issue highlighted competing American and British national and operational interests. With Eisenhower as Supreme Commander, the British expected to command the top ground and air positions--the former being General Montgomery. Americans expected Air Marshall Coningham to lead the air forces due to his well-known tactical expertise and leadership. When Air Marshall Sir Trafford Leigh-Mallory was selected, American contingents actually opposed the use of a single air commander,²⁸ fearing Leigh-Mallory would divert strategic bomber forces to operational invasion targets in France prematurely. Americans succeeded in keeping strategic forces out of the Allied Expeditionary Air Forces (AEAF), but not in having an American as strategic air commander. Eisenhower placed effective control of the heavy bombers under his deputy, the well-respected British Air Marshall Tedder.

Despite violating the AAF tenet of centralized control by having two air commanders for the invasion, the organization still functioned. Leigh-Mallory, given control of planning all air operations directly affecting the land campaign, produced excellent air attack and interdiction offensives against forward Luftwaffe airfields and transportation networks. Tedder coordinated all strategic attacks well beyond the land battle, while supporting the invasion as required by Eisenhower and Leigh-Mallory.²⁹ Within the AEAF, Brereton, the American Ninth Air Force commander, and Coningham, the British Second Tactical Air Force Commander, knew each other well from WDAF days, with mutual trust and similar airpower understanding well established. Tactical air

forces integrated smoothly, and the FM 100-20 precept that airmen should control air forces maintained.

Nonstandard command relationships at the top of the organization did not adversely affect the tactical organization. Under Leigh-Mallory's AEAF, the Ninth Air Force aligned with the American Twelfth Army Group, and beneath Ninth Air Force, the Ninth Tactical Air Command (TAC) aligned with the US First Army and the Nineteenth TAC cooperated with the US Third Army. The commanders of each understood their chain of command, airpower employment, and cooperative planning requirements. Airpower in the close support role thrived at these levels, reaching a crescendo of effectiveness.

The Ninth TAC commander, Major General Elwood "Pete" Queseda, effectively used previously unvalidated tactics in providing outstanding close support to First Army soldiers. Beginning with the breakout from St.-Lô on 26 July 1944 he used a technique called armored column support. This tactic entailed dedicated flights of close support aircraft escorting offensive drives by armored combat command task forces.³⁰ This lavish use of airpower, tremendously popular and successful, became standard procedure for accompanying the swift Allied drive through France.

While Queseda's tactic was innovative, it was not a new idea; he was the first to recognize that conditions existed for its successful employment. FM 1-10's section "Support of Armored forces," outlined the tactic's six procedural elements: (1) the ability to rapidly concentrate firepower on successive attack objectives with a precision timed to the high mobility of the armored unit, (2) advance arrangements for simple, prompt communication between ground forces and supporting aviation, (3) temporary

decentralization of control of combat aviation for timely employment of aviation for specific tasks, (4) direct radio telephone communication between armor and supporting air units, (5) extensive interchange of liaison officers by the participating forces, and (6) continuous, systematic reconnaissance executed by the supporting aviation to locate obstacles and enemy positions and transmit them to the supported force.³¹ Queseda understood that the vast increases in airpower availability, the enemy air situation, and the availability of new technology enabled such a technique.

Air superiority the Allies enjoyed during Operation Cobra left abundant sorties available for missions such as armored column support. When the advance began in earnest on 25 July, 1,507 heavy bombers and 559 fighter-bombers attacked with “negligible” enemy air opposition. Five bombers succumbed to ground fire, yet with zero air combat losses; the allies truly commanded the air.³² The relatively low percentage of sorties dedicated to air superiority (when compared to initial operations in Sicily and Italy), and the rising number of available aircraft allowed an increased focus on close support. This volume of usable airpower stimulated creative thinking on the part of the air leaders working with the land forces.

Queseda, with the Twelfth Army Group commander’s blessing, placed ASPs and their SCR-522 VHF radios in tanks and armored vehicles near the front of each armored column within a division.³³ Using the same radios as aircraft solved the rapid communication and compatibility problems; the radios had even been programmed with a separate channel for each controller to avoid interference from other close support missions nearby. These flights of four-to-eight aircraft escorted the armor, reporting enemy ground movement to the column commander and ASP, who directed attack by

aircraft, tank, or both. If no targets presented themselves, fighters conducted armed reconnaissance further forward of friendly lines, attacking targets of opportunity. Fighter-bomber target approval authority was delegated to combat command commanders, and attacks were “completed locally without reference to higher air or ground headquarters.”³⁴ The system of decentralized control and execution complied with each element of the FM 1-10 procedure and had immediate positive effects. On the first day of use, the Ninth TAC flew 72 squadrons (approximately 860 sorties) worth of missions,³⁵ and by week one’s end, the First Army–Ninth TAC team had destroyed some 2,000 motor vehicles, 80 artillery pieces, and 200 tanks.³⁶

Even as armored column support operated outside the normal close support request system, Ninth TAC and First Army expanded on their planning cycles for conventional CAS, standardizing practices used throughout the rest of the war in Europe. Advanced levels of detailed planning and tremendous flexibility, coupled with new, reliable, communications made the system unique. Synchronized operations and detailed integration with maneuver forces and field artillery produced outstanding combined effects against the German forces.

The Ninth TAC-First Army planning cycle began with a target identification conference held nightly at approximately 2000 hours. Here, general aircraft employment was determined based on Ninth Air Force needs, and air and ground plans. “Planned Missions,” those planned in detail for the following day, had predetermined aircraft, ordnance, targets, and attack timing. “Request Missions,” targets and missions generated after midnight were processed in accordance with priorities established at the 2000 meeting. The third mission type, called an “Immediate Request Mission,” was handled

and approved the same as a request mission, but received urgent priority. Planned and request missions were submitted by telephone, then wound through ASP channels until reaching the Joint TAC-Army HQ. Immediate request missions were submitted via radio, either the SCR-399 VHF radio or SCR-193 HF radio. Similar to Italian operations, immediate requests from division level could be monitored and vetoed by corps, while silence from corps indicated approval.

If the G-3 (army operations officer) and the A-3 (air force operations officer) at the Joint HQ approved the immediate request, an air support unit was tasked and provided target details, location, attack timing, as well as the color of artillery smoke identifying the target (red, green, or violet). Air support flight leaders contacted the controlling ASP on their SCR-522 radio five minutes prior attack to receive updates and confirm timing and target marking method. After the attack, both ASP and ground intelligence units passed attack results to the operations and planning teams. The army liaison officer at the air base closed the loop by reporting pilot and gun camera film recorded results back to Joint HQ, helping to shape the next day's missions.³⁷

The Allied air and ground efforts in Sicily, Italy, and France built up to a peak of efficiency during the Allied break-out of the Cherbourg Peninsula in Operation Cobra with a fine-tuned system of effective close support. Tactical leaders in France commanded from the same building, shared target information, intelligence and even aircraft for the betterment of the larger effort.³⁸ They in turn worked seamlessly with their Army Group counterparts. The professional relationship between Lieutenant General Omar N. Bradley (commanding the First US Army until 1 August 1944, then the Twelfth

Army Group) and Queseda, was a superior example of cooperation at the highest leadership levels, providing a model for future air-ground efforts.

When viewed in retrospect, the air and ground campaigns reinforced organizational and leadership concepts while giving birth to tremendous innovation in airpower use, air-ground cooperation, and the tactical air control system. As each theater matured, written doctrine proved most effective when used as a guide, interpreted and used based on the situation, and not as dogma. Leaders occasionally recognized that conditions had been set to allow previously untenable doctrinal concepts and tactics. For example, close coordination of the air and ground plans did not take place in Sicily, yet the operation succeeded due to reduced Axis resistance and the tremendous air effort generated even without ground coordination. Likewise, air command for Overlord was nondoctrinal, but success followed due to subordinate leadership and competence and other unique circumstances. Tactical innovation thrived, often based on doctrine, like the highly mobile Rover ASPs, the versatile Horsefly FAC(A), and the responsive armored column support system. These developments demonstrated the progress possible with superlative leadership, ingenuity, openness to change and cooperation, and technological advancement.

¹Robert Frank Futrell, *Ideas, Concepts, Doctrine*, vol. 1, *Basic Thinking in the United States Air Force 1907-1960* (Maxwell AFB, AL: Air University Press, December 1989), 139.

²*Ibid.*, 139-141.

³*Ibid.*, 141.

⁴US War Department, Training Circular No. 94, *Information and Suggestions Pertaining to Tactics, Equipment, Etc.* (Washington, D.C.: Government Printing Office, 26 November 1942), 1.

⁵Headquarters Fifth Army, "Memo on Organization for Air Support in Fifth Army," 10 March 1944, AFHRA Reference number 651.04-3.

⁶Bill Colgan, *World War II Fighter Bomber Pilot* (Blue Ridge Summit, PA: TAB Books, Inc., 1985), 37.

⁷Wesley Frank Craven and James Lea Cate, eds., *The Army Air Forces in World War II*, vol. 2, *Europe: Torch to Pointblank August 1942 to December 1943* (Chicago: University of Chicago Press, 1949), 418.

⁸Craven and Cate, vol. 2, 445.

⁹Craven and Cate, vol. 2, 419, 440.

¹⁰Alan F. Wilt, *Allied Cooperation in Sicily and Italy, 1943-1945*, in *Case Studies in the Development of Close Air Support*, ed. Benjamin Franklin Cooling (Washington, D.C.: Office of Air Force History, Special Studies, 1990), 199.

¹¹Stetson Conn, ed., *United States Army in World War II, The Mediterranean Theater of Operations: Sicily and The Surrender of Italy*, by Albert N. Garland and Howard McGraw Smyth (Washington, D.C.: US Army Office of the Chief of Military History, 1965), 107,167.

¹²Wilt, 200.

¹³Craven and Cate, vol. 2, 458.

¹⁴Wilt, 199.

¹⁵Kent R. Greenfield, ed., *United States Army in World War II, The Technical Services: The Signal Corps: The Test (December 1941 to July 1943)*, by George R. Thompson, Dixie R. Harris, Pauline M. Oakes, and Dulany Terrett (Washington, D.C.: Office of the Chief of Military History, 1957), 373.

¹⁶Craven and Cate, vol. 2, 486.

¹⁷Conn, *Sicily and the Surrender of Italy*, 421.

¹⁸Craven and Cate, vol. 2, 499.

¹⁹Harry A. Johnson, "Notes on Air Support taken during a Visit to Fifth Army Front between the 5th to 20th of February 1944," 8 March 1944, AFHRA Reference number 651.152, 1;Wilt, 206.

²⁰Wilt, 206-207.

²¹Craven and Cate, vol. 2, 527.

²²Johnson, *Notes on Air Support*, 1.

²³Colgon, 145; Johnson, *Notes on Air Support*, 1.

²⁴Colgon, 152-153.

²⁵Wilt, 207-209.

²⁶*Ibid.*, 217-218.

²⁷Charles D. Hightower, "The History of the United States Air Force Forward Air Controller in World War II, the Korean War, and the Vietnam Conflict" (master's thesis, US Army Command and General Staff College, 1984), 50.

²⁸William W. Momyer, *Airpower in Three Wars (WW II, Korea, Vietnam)* (Washington, D.C.: Government Printing Office, 1978), 46.

²⁹*Ibid.*, 49-50.

³⁰Wesley F. Craven and James L. Cate, *The Army Air Forces in World War II*, vol. 3, *Europe: Argument to V-E Day: January 1944 to May 1945* (Chicago: University of Chicago Press, 1951; reprint, Washington, D.C.: Office of Air Force History, 1983), 239 (page citations are to the reprint edition).

³¹US War Department, Air Corps Field Manual 1-10, *Tactics and Technique of Air Attack* (Washington, D.C.: Government Printing Office, 20 November 1940), 118-119.

³²Craven and Cate, vol. 3, 232-233.

³³Craven and Cate, vol. 3, 239.

³⁴Headquarters First US Army and Headquarters IX Tactical Air Command, "Report on Air-Ground Joint Operations," 6 August 1944, AFHRA Reference number 533.4501-3, 1, 10-11.

³⁵Craven and Cate, vol. 3, 240.

³⁶Headquarters First US Army and Headquarters IX Tactical Air Command, "Report on Air-Ground Joint Operations," 1.

³⁷Headquarters First US Army and Headquarters IX Tactical Air Command, "Report on Air-Ground Joint Operations"; Headquarters First Army, G-3 Air Section, "Memorandum on Air-Ground Joint Operations," 16 July 1944, AFHRA Reference number 533.4501-3.

³⁸Craven and Cate, vol. 3, 199.

CHAPTER 5

CONCLUSIONS

The purpose of this thesis was to analyze American CAS doctrine changes and the influences behind those changes, over the years from World War I through September of 1944 in World War II. Research focused on three principal topics: (1) organization, command, and control, as they relate to the use of air support, (2) the role of airpower as planned and integrated to support ground forces, and (3) the personnel, equipment, and procedures for requesting and controlling CAS, the TACS. The fourth element of liaison was highlighted appropriately due to its inextricability from the discussion of integration and TACS. While the years prior to September 1939 certainly were rife with debate, controversy, and even struggle over control and use of airpower assets supporting ground forces, little real progress was evident until the Second World War began. Four principal themes emerged in the research that bear discussion. First, the essential role that senior leadership figures played in forcing change on an ineffective air organization and command structure. Second, the validation of published airpower concepts in the role airpower played in CAS. Third, the positive effects that liaison had on the planning and execution of CAS, and fourth, the critical role that the tactical air control system played in effective close support. Lastly, the relevance of the study today will be addressed, with recommendations for further research.

Almost all of the successful doctrinal concepts surrounding CAS existed in some form prior to US involvement in World War II--just waiting to be prioritized and used. The influence British leaders exerted in assisting American leaders in this emergence cannot be understated. As Colonel William "Billy" Mitchell tutored under Air Marshall

Trenchard during World War I, American air leaders began to understand the tenet of centralized control and airpower's influence on the ground battle. In September 1939, General Arnold sent observers to London to study British plans and to draw lessons for American doctrine. In 1941 Arnold himself traveled to London for strategic planning purposes and returned with the British tactical air control plan, directly energizing the fledgling US system.

American airmen sent to the Middle East in 1942 fought under British tutelage and received rapid indoctrination on combat air operations. Specifically, Air Vice Marshall Arthur Coningham influenced American tactical airpower and employment, perhaps more than any other foreign airman. His Western Desert organization, working alongside the Desert Army, reinforced in American General Louis Brereton essential airpower employment concepts. The failure of those lessons to be transmitted or absorbed into Operation Torch's organization, command, and control plans, a function of the distance between theaters and American overconfidence in FM 31-35, resulted in a flawed system, requiring massive changes in early 1943. Within days of General Eisenhower's restructuring the chain of command and Coningham's assumption of command of all tactical air forces, a rapid and positive swing in tactical airpower effectiveness occurred.

Besides British leadership influence, the outstanding ability of strong World War II American leaders emerged, able to recognize the need for change and to effect that change despite strong personalities and major ongoing combat. Battle clearly exposed both flaws and opportunities in the Allied air organization and command systems, and the leadership reacted when solutions were discovered. The need for an overall airman in

command of airpower, while recognized and advocated by some in peacetime, was a prime example. Prewar maneuvers and exercises were conducted in such haste and small scale that organization and command lessons did not highlight themselves. However, when Operation Torch began and when each army commander began using their limited airpower for exclusive defensive air cover against a superior air threat, dramatic losses occurred. The reorganization created an overall air commander despite ground commander objections, while pushing aside provisions of FM 31-35, the most current, jointly agreed upon air support doctrine. When the system failed, leaders changed it and moved forward.

Tactical level leadership also recognized the need for change. In North Africa, the concept of dedicated formations of aircraft orbiting over a friendly unit for their exclusive protection and use proved disastrous. No air superiority, poor logistical flow, lack of forward bases, poor weather, inadequate radio communications, and a shortage of aircraft made such attempts futile and costly. Those factors had all reversed within eighteen months when in France, General Quesada recognized that conditions were ready for his highly successful armored column support tactic. Leadership at all levels either proved adaptable and flexible, or they were replaced.

Prior to World War II airpower doctrine described various combat missions, roughly summarized into: air superiority (attacking both enemy airfields and airborne aircraft), strategic bombing (targets well away from friendly land forces), interdiction (isolation of the battlefield by attacking reserves, troop columns and equipment), and close support (direct support to ground forces). Air employment doctrine addressed each, but compromises made to ground force leaders prevented conclusive documentation of

employment standards. As early as 1926, TR 440-15 listed air superiority as the first mission, yet each subsequent piece of doctrine published also included the basic understanding that land force commanders would control that airpower. In 1942, FM 31-35 emerged as the latest iteration of decentralized control writings, detailing that the land commander had the ultimate say in both aircraft mission and targets. The lack of understanding that dedicating all one's airpower to localized defensive air cover would: (1) wear out assets and personnel, and (2) accomplish little towards ridding the skies of offending enemy aircraft, was causal in the Allies poor early air performance over North Africa, while generating interservice bitterness and mistrust.

When Eisenhower and the Combined Chiefs of Staff changed the organization, replacing who controlled the use of airpower, they established proper priorities, enabling effective air support. Coningham insisted first on attaining air superiority over the battlefield, then using airpower to isolate the enemy, while providing close support when needed. Above all, his system demanded flexibility, the ability to rapidly shift from one mission or location to another, ensuring massive firepower when and where it was needed. As a result, troops on the ground saw less of Allied aircraft than before, but they also endured fewer attacks by German aircraft. As evidence, they discovered vanquished enemy convoys in the advance towards Tunis, and upon arrival, found the German logistical bases and airfields demolished.

With Allied air superiority, windows of opportunity opened for other missions, greatly influencing the CAS effort. In Italy, the air support request system was highly developed in the permissive air environment, and the FAC(A) was born. These L-5 Horseflies, long associated with providing timely reconnaissance and intelligence to the

ground commander simply required a compatible radio system to control fighters. With their airborne view of the targets, knowledge of the ground commander's intent, common language and procedures, and extended radio range, the FAC(A)s could efficiently facilitate aircraft attacks. This concept was not new; TC 52 from August 1941 stated that observation aircraft could be used to direct fighters on to ground targets, just needing the correct conditions for success. Ground forward air controllers gained prominence with improved radio technology, mounting aircraft VHF radios on jeeps and trucks and traveling with maneuver units to observe and call for support. These parties became known as "Rovers" and greatly enhanced CAS responsiveness and flexibility. When radio or terrain obstacles could not be overcome, they extended control to the Horsefly controllers.

The same can be said for the armored column support tactic of 1944 Europe; 1940's FM 1-10, *Tactics and Technique of Air Attack*, spelled the concept out in detail, but conditions in North Africa were not suitable to its use. It was not until France, with its large armored forces, maneuvering with an aggressive ground commander, with an innovative air commander, air superiority, abundant excess sorties, forward operating bases, and suitable logistics that the concept was made practical, and then it flourished, becoming a standard technique through war's end.

Much as liaison at the highest levels of planning were crucial to success, the same was true down the chain to the corps, division, and below. Liaison at these lower levels was synonymous with the men running the TACS, recommending targets, requesting air support, and controlling the air strikes. The system they executed required a highly efficient request and execution procedure. Based on British input and 1941 maneuver

results, the system was specified in FM 31-35 in 1942 for use in Operation Torch. The AAF provided the officers and enlisted men for the ASP teams, the communications equipment to talk to higher headquarters and the aircraft, and the liaison required to plan and request air support. From this template developed a TACS where daily requests for the use of air support were planned at the lowest units (combat commands in an armor division), then elevated to the division, corps, and army levels for approval. For rapidly emerging targets, a radio request could be made for immediate servicing by ground or airborne alert aircraft. These aircraft were just minutes away and after being guided by an ALO or FAC(A), quickly identified and attacked the enemy.

This complex system held several key requirements that still hold true today: (1) sufficient apportioned sorties after ensuring air superiority, (2) experienced personnel on the ground--preferably combat aviators--who could advise the ground commander on airpower and efficiently identify targets to aircraft, and (3) a communications suite capable of contacting the aligned ground unit, higher headquarters, and aircraft in flight. By September 1944 and Operation Cobra, the air support system had solved each of these challenges with the vast numbers of aircraft and pilots available, coupled with dedicated air superiority efforts. Requiring highly experienced fighter-bomber pilots to rotate through ALO positions with ground units and the leap in radio capability that came with the production and wide distributions of the SCR-522 aircraft radio in ground vehicles added to the solution. The SCR-522 radios were small enough to fly in an aircraft or put in a jeep, powerful enough to range distant aircraft and headquarters, rugged enough to withstand the punishment of air and ground movements, and agile enough to use the dedicated air support and administrative frequencies assigned.

Fundamental issues surrounding close support are still of great interest and are heatedly debated today. Recent events during Operations Enduring and Iraqi Freedom demonstrated that despite four major and numerous minor conflicts since World War II, there is still much room for education and improvement in the CAS arena. While airpower use, liaison between ground and air forces, compatible communications, and the TACS all deserve continued study and development, organization and control of airpower seems to have settled into a working construct.

Current US Air Force doctrine has committed to always providing air superiority and protection from air attack over an area of operations. Once that has been achieved and can be retained, the question becomes, what should airpower focus on next? The Air Force's predilection for interdiction stems from its efficiency and predictable nature, and the growing ability to find, fix, and attack targets without added coordination with frontline ground forces. The apportionment, or balance of resources, will be critical in future conflicts where dominant air supremacy is enjoyed or not required, as may be the case in air combat against nonstate actors. In Operation Iraqi Freedom, the volume of sorties available accelerated the number of CAS sorties "pushed" towards the frontline tactical air control parties who often lacked targets for them to hit. The resulting inefficiency was undesirable to airmen seeking quantifiable mission effectiveness; while ground forces enjoyed the abundance of airpower available to them. This occurred even as air superiority fighters redeployed home during the conflict for lack of airborne targets.

Operation Anaconda in Afghanistan in March 2002 raised the ghost of independent ground and air force planning, resulting in a near crisis situation for close support. In this case the land and air force headquarters were hundreds of miles apart, and

the liaison that could have made for effective cooperation was practically nonexistent. At the tactical level, despite numerous officer and enlisted liaisons, there was incomplete planning for airspace deconfliction, frequency management and standard procedures. In the aftermath of Anaconda, the US Air Force proposed a new wartime position on the land component commander's staff, the Air Component Coordination Element, whose purpose was to ensure mutual understanding and synchronization of the air and land component plans. This element proved successful in its intended role during Operation Iraqi Freedom, integrating into the land component commander's staff,

Lastly, with the ever-increasing speed that today's military can unleash lethal precision fires, communications systems must keep pace by providing compatible equipment. Much as the SCR-522 required additional frequencies to be hard-wired to accommodate armored column support, today's systems require increased adaptability. The abundance of users consuming frequency bandwidth for today's luxuries, such as streaming video links and teleconferences, threatens to squeeze other necessary communications out of the system. The services must dedicate themselves to developing compatible equipment to include anti-jam, data link, and secure communications capability. The Joint Tactical Radio System is one such system that must be aggressively pursued and refined to meet this goal. Merging procedural doctrine to ensure a common language will be required, much as Joint Publication 3-09.3, *Joint Tactics Techniques and Procedures for CAS*, has done. Lastly, frequent joint training in realistic scenarios to ensure proficiency must be exercised. The preparation, execution, and experience derived thereof is the only way leaders will recognize what elements in a system are flawed and need decisive. The common thread of each element mentioned is leadership. All the

American services require visionary, competent, strategic, operational, and tactical leadership that not only understands their own capabilities and requirements, but also comprehends those of the other services. Leaders of this caliber, able to recognize the need or opportunity for change, will enable the US military to overcome potential wartime challenges in peacetime.

The research for this thesis revealed several other areas of potential study, both historical and current. The first area concerns military aircraft radio technology development between the wars, exploring why it lagged other technical developments, yet was able to rapidly advance during the first years of World War II. Another area concerns the effectiveness of the observers General Arnold sent to combat theaters to observe the war efforts. Specifics regarding their missions, tasks, and most importantly how Arnold expected to apply what was learned may be useful in the continued fight against terror organizations. The last area proposed is an examination of the impact of total air supremacy, or the lack of a need for offensive air supremacy, as CAS evolves in the realm the nonstate, low signature enemy operating within third-party state boundaries.

BIBLIOGRAPHY

Primary Sources

Books

- Arnold, Henry H. *Global Mission*. London: Hutchinson and Co., Ltd, 1951.
- Brereton, Lewis H. *The Brereton Diaries: The War in the Air in the Pacific, Middle East and Europe, 8 October 1941-8 May 1945*. New York: William Morrow and Co., 1946.
- Colgan, Bill. *World War II Fighter Bomber Pilot*. Blue Ridge Summit, PA: TAB Books, Inc., 1985.
- Momyer, William W. *Airpower in Three Wars (WWII, Korea, Vietnam)*. Washington, D.C.: Government Printing Office, 1978.
- Tedder, Arthur William. *Airpower in War*. London: Hodder and Stoughton, 1948.
- _____. *With Prejudice: The War Memoirs of Marshall of the Royal Air Force Lord Tedder G.C.B.* Boston: Little, Brown and Co., 1966.
- Montgomery, Bernard L. "High Command in War and Conduct in Battle." Pamphlet distributed in Tripoli, February 1943. Photocopied.

Unpublished Documents

- Headquarters GHQ Air Force. "GHQ Air Force Training Directive, 1941-1942." Bolling Field, Washington, D.C., 1 June 1941. National Archives, Record Group 407, Records of the Adjutant General's Office. Photocopied.
- Headquarters Air Force Combat Command. "17th Bomb Wing (Light) Report on Combined Tests to Develop Doctrines and Methods for Aviation Support of Ground Forces." Savannah Army Air Base, GA, 2 July 1941. National Archives, Record Group 337, Records of the Army Ground Forces. Photocopied.
- Headquarters Second Air Force. "Plan of Air Support of 2nd Army by 2nd Air Task Force." Fort George Wright, Washington, D.C., 19 August 1941. National Archives, Record Group 337, Records of the Army Ground Forces. Photocopied.

Headquarters Second Air Force. "Report on 2nd Air Task Force Participation in Louisiana Maneuvers: Section II, Combat Operations (September 15-28, 1941 Inclusive)." National Archives, Record Group 337, Records of the Army Ground Forces, Entry 57. Photocopied.

Roberts, Jack. "Report on Employment of Aviation in Close Support of Ground troops." Ellington Field, TX, 30 September 1941. National Archives, Record Group 337, Records of the Army Ground Forces, Entry 57. Photocopied.

Headquarters Air Force Combat Command. "Supplementary Training Directive, 1941-1942 for Air Support Aviation." Bolling Field, Washington, D.C., 4 December 1941. National Archives, Record Group 337, Records of the Army Ground Forces, Entry 57. Photocopied.

Headquarters Air Force Combat Command. "Final Report on Employment of Aviation in Close Support of Ground Troops." Bolling Field, Washington, D.C., 9 January 1942. National Archives, Record Group 337, Records of the Army Ground Forces, Entry 57. Photocopied.

Headquarters XII Air Support Command. "Outline Plan for Operation Wop." 3 March 1943. AFHRA reference number 651.306.

Headquarters VIII Air Support Command. "Interview with General Craig regarding Air Support during African Mission." 5 April 1943. AFHRA reference number 533.451-7.

Headquarters XII Air Support Command. "Report on Operations conducted by XII Air Support Command, Tunisia: 13 January 1943-9 April 1943." 9 April 1943. AFHRA reference number 651.3069-1.

Headquarters XII Air Support Command. "Report on XII Air Support Command Operations in Tunisia." 9 June 1943. AFHRA reference number 651.04-2.

Headquarters XII Air Support Command. "Report of Tunisian Operations by XII Air Support Command, 10 April to 13 May." 23 November 1943. AFHRA reference number 651.306-1.

Headquarters Ninth Air Force. "Agenda for 24 January 1944 General Officer Indoctrination Course on Ninth Air Force Operations." 17 January 1944. AFHRA Reference Number 533.4501-8.

Headquarters Ninth Air Force. "Memorandum to General Brereton: General Picture of Air Support in the Assault (Tentative)." 23 January 1944. AFHRA.

Johnson, Harry A. "Notes on Air Support taken during a visit to Fifth Army Front between the 5th to 20th of February 1944." 8 March 1944. AFHRA reference number 651.152.

- Headquarters Fifth Army. "Memo on Organization for Air Support in Fifth Army." 10 March 1944. AFHRA reference number 651.04-3.
- Headquarters Allied Expeditionary Air Force. "Direct Air Support Plan for OVERLORD." 23 April 1944. AFHRA.
- Headquarters XII Air Support Command. "Report on XII Air Support Command in the Tunisian Campaign: January–May 1943." May 1944. AFHRA reference number 651.04-1.
- Headquarters VII Corps. "Report on Air Force Operations in Support of Attack on Cherbourg, 22 June thru 30 June 1944." June 1944. AFHRA reference number 533.4501-4.
- Headquarters First US Army and Headquarters IX Tactical Air Command. "Report on Air-Ground Joint Operations." 6 August 1944. AFHRA reference number 533.4501-3.
- George, Robert H. "Report on Air support received by the French Second Armored Division on 13 September 1944." 10 November 1944. AFHRA reference number 533.4501-10.
- Headquarters XXIX Tactical Air Command. "Report on Effectiveness of Close-In Air Cooperation." 1945. AFHRA reference number 533.4501-1.
- Headquarters Ninth Air Force. "Operational History of the Ninth Air Force: Book IV, Tactical Annex (June 1942–May 1945)." 26 June 1946. AFHRA reference number 533.01-2.
- Headquarters Ninth Air Force. "Operational History of the Ninth Air Force: Book V, Ground Force Annexes." 26 June 1946. AFHRA reference number 533.01-2.

Secondary Sources

Books

- Cooling, Benjamin Franklin, ed. *Case Studies in the Development of Close Air Support*. Washington, D.C.: Office of Air Force History, 1990.
- Conn, Stetson, ed. *United States Army in World War II. The Mediterranean Theater of Operations: Sicily and The Surrender of Italy*, by Albert N. Garland and Howard McGraw Smyth. Washington, D.C.: US Army Office of the Chief of Military History, 1965.

- Conn, Stetson, ed. *United States Army in World War II. The Technical Services: The Signal Corps: The Outcome (Mid-1943 Through 1945)*, by George R. Thompson and Dixie R. Harris. Washington, D.C.: US Army Office of the Chief of Military History, 1966.
- Craven, Wesley F. and James L. Cate, eds. *The Army Air Forces in World War II. Vol. 1, Plans and Early Operations: January 1939 to August 1942*. Chicago: University of Chicago Press, 1948.
- _____. *The Army Air Forces in World War II. Vol. 2, Europe: Torch to Pointblank: August 1942 to December 1943*. Chicago: University of Chicago Press, 1949.
- _____. *The Army Air Forces in World War II. Vol. 3, Europe: Argument to V-E Day: January 1944 to May 1945*. Chicago: University of Chicago Press, 1951. Reprint, Washington, D.C.: Office of Air Force History, 1983.
- Finney, Robert T. *History of the Air Corps Tactical School: 1920-1940*. Maxwell AFB, AL: Research Studies Institute, USAF Historical Division, Air University, 1955. Reprint, Air Force History and Museums Program, 1998.
- Futrell, Robert Frank. *Ideas, Concepts, Doctrine. Vol. 1, Basic Thinking in the United States Air Force, 1907-1960*. Maxwell AFB, AL: Air University Press, December 1989.
- Gabel, Christopher R. *The U.S. Army GHQ Maneuvers of 1941*. Washington, D.C.: US Army Center of Military History, 1991. Reprint, Washington, D.C.: US Army Center of Military History, 1992.
- Greenfield, Kent R., ed. *United States Army in World War II. The Mediterranean Theater of Operations: Northwest Africa: Seizing the Initiative in the West*, by George F. Howe. Washington, D.C.: US Army Office of the Chief of Military History, 1957.
- _____. *United States Army in World War II. The Technical Services: The Signal Corps: The Emergency (To December 1941)*, by Dulany Terret. Washington, D.C.: US Army Office of the Chief of Military History, 1956.
- _____. *United States Army in World War II. The Technical Services: The Signal Corps: The Test (December 1941 to July 1943)*, by George R. Thompson, Dixie R. Harris, Pauline M. Oakes, and Dulany Terrett. Washington, D.C.: US Army Office of the Chief of Military History, 1957.
- Greenfield, Kent R., Robert R. Palmer and Bell I. Wiley. *The United States Army in World War II. The Army Ground Forces: The Organization of Ground Combat Troops*. Washington, D.C.: Department of the Army Historical Division, 1947.

- Greer, Thomas H. *The Development of Air Doctrine in the Army Air Arm, 1917-1941*. Maxwell AFB, AL: USAF Historical Division, Research Studies Institute, Air University, 1955. Reprint, Washington, D.C.: Office of Air Force History, 1985.
- Hallion, Richard P. *Strike from the Sky: The History of Battlefield Air Attack, 1911-1945*. Washington and London: Smithsonian Institution Press, 1989.
- Jacobs, Will A. *The Battle for France, 1944*. In *Case Studies in the Development of Close Air Support*, ed. Benjamin Franklin Cooling. Washington, D.C.: Office of Air Force History, 1990.
- Kennett, Lee. *Developments to 1939*. In *Case Studies in the Development of Close Air Support*, ed. Benjamin Franklin Cooling. Washington, D.C.: Office of Air Force History, 1990.
- Maurer, Maurer, ed. *Air Force Combat Units of World War II*. Washington, D.C.: US Air Force Historical Division, Air University, 1961.
- Mets, David R. *A Glider in the Propwash of the Royal Air Force?* In *Airpower and Ground Armies: Essays on the Evolution of Anglo-American Air Doctrine, 1940-1943*. ed. Daniel R. Mortensen. Maxwell AFB, AL: Air University Press, 1998.
- Meilienger, Phillip S. *Airmen and Air Theory: A Review of the Sources*. Maxwell AFB, AL: Air University Press, 1995. Reprint, Maxwell AFB, AL: Air University Press, 2001.
- Mortensen, Daniel R. *A Pattern for Joint Operations: World War II Close Air Support, North Africa*. Washington, D.C.: Office of Air Force History and US Army Center of Military History, 1987.
- _____. *The Legend of Laurence Kuter*. In *Airpower and Ground Armies: Essays on the Evolution of Anglo-American Air Doctrine, 1940-1943*. Maxwell AFB, AL: Air University Press, 1998.
- Muller, Richard R. *Close Air Support: The German, British, and American Experiences, 1918-1941*. In *Military Innovation in the Interwar Period*, eds. Williamson Murray and Allan R. Millett. United Kingdom: Cambridge University Press, 1996. Reprint, United Kingdom: Cambridge University Press, 1998.
- Murray, Williamson. *The Luftwaffe Experience, 1939-1941*. In *Case Studies in the Development of Close Air Support*, ed. Benjamin Franklin Cooling. Washington, D.C.: Office of Air Force History, 1990.
- Orange, Vincent. *Getting Together*. In *Airpower and Ground Armies: Essays on the Evolution of Anglo-American Air Doctrine, 1940-1943*, ed. Daniel R. Mortensen. Maxwell AFB, AL: Air University Press, 1998.

- Spires, David N. *Airpower for Patton's Army: The XIX Tactical Air Command in the Second World War*. Washington, D.C.: Air Force History and Museums Program, 2002.
- Syrett, David. *The Tunisian Campaign, 1942-1943*. In *Case Studies in the Development of Close Air Support*, ed. Benjamin Franklin Cooling,. Washington, D.C.: Office of Air Force History, 1990.
- Taylor, Joe Gray. *American Experience in the Southwest Pacific*. In *Case Studies in the Development of Close Air Support*, ed. Benjamin Franklin Cooling. Washington, D.C.: Office of Air Force History, 1990.
- Whiting, Kenneth R. *Soviet Air-Ground Coordination, 1941-1945*. In *Case Studies in the Development of Close Air Support*, ed. Benjamin Franklin Cooling. Washington, D.C.: Office of Air Force History, 1990.
- Wilt, Alan F. *Allied Cooperation in Sicily and Italy, 1943-1945*. In *Case Studies in the Development of Close Air Support*, ed. Benjamin Franklin Cooling. Washington, D.C.: Office of Air Force History, 1990.

Government Publications

Training Regulations and Field Manuals

- US War Department. Air Corps Training Regulation 440-15, *Employment of the Air Forces of the Army*. Washington, D.C.: Government Printing Office, 26 January 1926.
- US War Department. Air Corps Training Regulation 440-15, *Employment of the Air Forces of the Army*. Washington, D.C.: Government Printing Office, 15 October 1935.
- US War Department. Air Corps Training Regulation 440-40, *Aerial Gunnery and Bombing*. Washington, D.C.: Government Printing Office, 26 November 1935.
- US War Department. Air Corps Field Manual 1-5, *Employment of Aviation of the Army*. Washington, D.C.: Government Printing Office, 15 April 1940.
- US War Department. Air Corps Field Manual 1-10, *Tactics and Technique of Air Attack*. Washington, D.C.: Government Printing Office, 20 November 1940.
- US War Department. Basic Field Manual 31-35, *Aviation in Support of Ground Forces*. Washington, D.C.: Government Printing Office, 9 April 1942. Photocopied.

US War Department. Army Air Forces Field Manual 1-15, *Tactics and Technique of Air Fighting*. Washington, D.C.: Government Printing Office, 10 April 1942.

US War Department. Army Air Forces Field Manual 1-45, *Signal Communication*. Washington, D.C.: Government Printing Office, 4 December 1942.

US War Department. Army Air Forces Field Manual 1-5, *Employment of Aviation of the Army*. Washington, D.C.: Government Printing Office, 18 January 1943.

US War Department. War Department Field Manual 100-20, *Command and Employment of Airpower*. Washington, D.C.: Government Printing Office, 21 July 1943. In *Airpower and Ground Armies: Essays on the Evolution of Anglo-American Air Doctrine, 1940-1943*, ed. Daniel R. Mortensen. Maxwell AFB, AL: Air University Press, 1998.

US Joint Staff. Joint Publication 3-09.3, *Joint Tactics, Techniques and Procedures for Close Air Support*. Washington, D.C.: Government Printing Office, 3 September 2003.

Training Circulars and Directives

US War Department. War Department Directive, "Air Corps Training, 1939-1940." Washington, D.C., 16 June 1939.

US War Department. Training Circular No. 52, *Employment of Aviation in Close Support of Ground Troops*. Washington, D.C.: Government Printing Office, 29 August 1941.

US War Department. Training Circular No. 70, *Army Air Forces—Basic Doctrine*. Washington, D.C.: Government Printing Office, 16 December 1941.

US War Department. Training Circular No. 14, *Signal Communication, Air Support Command*. Washington, D.C.: Government Printing Office, 25 March 1942.

US War Department. Training Circular No. 28, *Air-Ground Visual Communication*. Washington, D.C.: Government Printing Office, 12 May 1942.

US War Department. Training Circular No. 36, *Tentative Guide for Observation Aviation*. Washington, D.C.: Government Printing Office, 16 June 1942.

US War Department. Training Circular No. 56, *Air-Ground Visual Communication*. Washington, D.C.: Government Printing Office, 19 August 1942.

US War Department. Training Circular No. 94, *Information and Suggestions Pertaining to Tactics, Equipment, etc.* Washington, D.C.: Government Printing Office, 26 November 1942.

US War Department. Training Circular No. 95, *Tactics of the Unsupported Day Air Attack.* Washington, D.C.: Government Printing Office, 27 November 1942.

US War Department. Training Circular No. 17, *Air-Ground Liaison.* Washington, D.C.: Government Printing Office, 20 April 1945.

US War Department. Training Circular No. 30, *Tactical Air Command: Organization and Employment.* Washington, D.C.: Government Printing Office, 19 June 1945.

Theses

Cox, Gary C. "Beyond the Battle Line: US Air Attack Theory and Doctrine, 1919-1941." Thesis, Air University, June 1995.

Hasken, Scott A. "A Historical Look at Close Air Support." Master's thesis, US Army Command and General Staff College, 2003.

Hightower, Charles D. "The History of the United States Air Force Forward Air Controller in World War II, the Korean War, and the Vietnam Conflict." Master's thesis, US Army Command and General Staff College, 1984.

Lewis, Michael. "Lt GEN Ned Almond, USA: A Ground Commander's Conflicting View with Airmen over Close Air Support Doctrine and Employment." Thesis, Air University, August 1990.

Steadman, Ken. "A Comparative Look at Air-Ground Support Doctrine and Practice in World War II." Master's thesis, US Army Command and General Staff College, 1982.

INITIAL DISTRIBUTION LIST

Combined Arms Research Library
U.S. Army Command and General Staff College
250 Gibbon Ave.
Fort Leavenworth, KS 66027-2314

Defense Technical Information Center/OCA
825 John J. Kingman Rd., Suite 944
Fort Belvoir, VA 22060-6218

LTC Marlyn Pierce
Combat Studies Institute
USACGSC
1 Reynolds Ave.
Fort Leavenworth, KS 66027-1352

Dr. Jerold E. Brown
Combat Studies Institute
USACGSC
1 Reynolds Ave.
Fort Leavenworth, KS 66027-1352

Lt Col Ralph S. Hansen
Air Force Element
USACGSC
1 Reynolds Ave.
Fort Leavenworth, KS 66027-1352

Dr. Christopher R. Gabel
Combat Studies Institute
USACGSC
1 Reynolds Ave.
Fort Leavenworth, KS 66027-1352

Maj Gregory Zehner
School of Advanced Military Studies
317 N. Esplanade Ave
Leavenworth, KS 66048

Lt Col (Ret) Peter W. Wielhouwer
27 Winton Rd
East Windsor, CT 06088

CERTIFICATION FOR MMAS DISTRIBUTION STATEMENT

1. Certification Date: 18 June 2004

2. Thesis Author: Major Philip W. Wielhouwer

3. Thesis Title: Trial by Fire: Forging American Close Air Support Doctrine, World War I Through September 1944

4. Thesis Committee Members: _____

Signatures: _____

5. Distribution Statement: See distribution statements A-X on reverse, then circle appropriate distribution statement letter code below:

(A) B C D E F X SEE EXPLANATION OF CODES ON REVERSE

If your thesis does not fit into any of the above categories or is classified, you must coordinate with the classified section at CARL.

6. Justification: Justification is required for any distribution other than described in Distribution Statement A. All or part of a thesis may justify distribution limitation. See limitation justification statements 1-10 on reverse, then list, below, the statement(s) that applies (apply) to your thesis and corresponding chapters/sections and pages. Follow sample format shown below:

EXAMPLE

<u>Limitation Justification Statement</u>	/	<u>Chapter/Section</u>	/	<u>Page(s)</u>
Direct Military Support (10)	/	Chapter 3	/	12
Critical Technology (3)	/	Section 4	/	31
Administrative Operational Use (7)	/	Chapter 2	/	13-32

Fill in limitation justification for your thesis below:

<u>Limitation Justification Statement</u>	/	<u>Chapter/Section</u>	/	<u>Page(s)</u>
_____	/	_____	/	_____
_____	/	_____	/	_____
_____	/	_____	/	_____
_____	/	_____	/	_____
_____	/	_____	/	_____

7. MMAS Thesis Author's Signature: _____

STATEMENT A: Approved for public release; distribution is unlimited. (Documents with this statement may be made available or sold to the general public and foreign nationals).

STATEMENT B: Distribution authorized to U.S. Government agencies only (insert reason and date ON REVERSE OF THIS FORM). Currently used reasons for imposing this statement include the following:

1. Foreign Government Information. Protection of foreign information.
2. Proprietary Information. Protection of proprietary information not owned by the U.S. Government.
3. Critical Technology. Protection and control of critical technology including technical data with potential military application.
4. Test and Evaluation. Protection of test and evaluation of commercial production or military hardware.
5. Contractor Performance Evaluation. Protection of information involving contractor performance evaluation.
6. Premature Dissemination. Protection of information involving systems or hardware from premature dissemination.
7. Administrative/Operational Use. Protection of information restricted to official use or for administrative or operational purposes.
8. Software Documentation. Protection of software documentation - release only in accordance with the provisions of DoD Instruction 7930.2.
9. Specific Authority. Protection of information required by a specific authority.
10. Direct Military Support. To protect export-controlled technical data of such military significance that release for purposes other than direct support of DoD-approved activities may jeopardize a U.S. military advantage.

STATEMENT C: Distribution authorized to U.S. Government agencies and their contractors: (REASON AND DATE). Currently most used reasons are 1, 3, 7, 8, and 9 above.

STATEMENT D: Distribution authorized to DoD and U.S. DoD contractors only; (REASON AND DATE). Currently most reasons are 1, 3, 7, 8, and 9 above.

STATEMENT E: Distribution authorized to DoD only; (REASON AND DATE). Currently most used reasons are 1, 2, 3, 4, 5, 6, 7, 8, 9, and 10.

STATEMENT F: Further dissemination only as directed by (controlling DoD office and date), or higher DoD authority. Used when the DoD originator determines that information is subject to special dissemination limitation specified by paragraph 4-505, DoD 5200.1 -R.

STATEMENT X: Distribution authorized to U.S. Government agencies and private individuals of enterprises eligible to obtain export-controlled technical data in accordance with DoD Directive 5230.25; (date). Controlling DoD office is (insert).